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University — Université: UNIVERSITY OF ALBERTA	
Degree for which thesis was presented — Grade pour lequel cette thèse fut présentée: M.N.	
Year this degree conferred — Année d'obtention de ce grade: SPRING 1982	Name of Supervisor — Nom du directeur de thèse: DR. S. STINSON

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SENSE OF COHERENCE: A MEASURE OF HEALTH STATUS

BY

© LOUISE PAYNE

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF NURSING

FACULTY OF NURSING

EDMONTON, ALBERTA

SPRING, 1982

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Shirley M. Stinson
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DATE April 7/82

ABSTRACT

Why do some people manage to stay and feel healthy despite the ubiquity of stressors? The rationale underlying this investigation is that there is a distinct need to develop reliable and valid instruments to measure the concept of "health".

This study was aimed at the measurement of the central variable in Antonovsky's Salutogenic Model of Health (1979), that of "sense of coherence" (p. 123). The main objective was to develop a scale for measuring "sense of coherence" and to establish some validity estimates for that scale (Health Coherence Attitude Scale). Based upon an extensive literature review, assumptions related to the concept of "sense of coherence" were evolved and relationships to health status were identified. Theoretically, the origins of health are rooted in a sense of coherence.

Sense of coherence was defined as "an enduring attitude reflecting the degree to which one perceives stimuli to be comprehensible, manageable and meaningful." Health was defined according to Antonovsky's four facets: pain, functional limitations, prognostic implications and action potential. In an effort to obtain a valid, quantifiable measure of health, a cardiorespiratory fitness index based on a submaximal exercise test was utilized.

The subjects of this study were 45 middle-aged males with coronary heart disease. It was anticipated that the stronger the sense of coherence of individuals, the more adequately they would cope with stressors in everyday life and maintain or improve their positions on the health ease/dis-ease continuum. A dependent (repeated measures) design was utilized in this study.

The validation studies achieved a degree of face validity for the Health Coherence Attitude Scale. Based upon the limited familiarity of the content experts with the Salutogenic Model, a questionable degree of content validity was established.

To investigate the validity of the construct measured, factor analytic procedures were carried out. The factor solution emerging tended to imply a multidimensional construct with one strong factor. However, in discussing this finding, measurement error as well as a possible unidimensional solution was explored.

To establish if differences over time in the construct measured were significant, analyses of pretest and posttest scores were carried out. A significant difference was found in the health status of subjects. No concomitant change in subjects' sense of coherence was identified.

It was hypothesized that if sense of coherence changes, health status simultaneously changes. It was demonstrated that the mean factor scores were related not only to the subjective interpretation of health state, but to objective quantifiable measurements of cardiovascular function. A relationship between subjects' residual scores for sense of coherence and the residual scores of the health measures was not reflected.

It was also hypothesized that subjects expected by theory or judged to have improved in health status would show the most change in sense of coherence. Analysis of variance results yielded descriptive mean differences between groups.

Finally, the residual score for sense of coherence was not established as a predictor in improving the relationship between health

and demographic risk factors. The possibility that an explanation might lie in the "prevailing attitude of the coronary prone personality" (Friedman and Rosenman, 1974) was considered.

Recommendations for further research were made. Salutogenesis as a concept compels health researchers to examine everything of significance to people, with health interacting in all realms of life.

ACKNOWLEDGEMENTS

Sincere appreciation is expressed to the Chairman of my thesis, Dr. Shirley Stinson, for her faith in my ability and her guidance throughout the course of this study. To the other members of my committee, Dr. C. Hazlett, Dr. H. Simmons and Dr. C. Kappagoda, I am deeply indebted for their help and understanding. To Dr. H. Simmons for her guidance in the conceptualization of the theoretical framework, to Dr. C. Hazlett for his expert appraisal and patience in the design and analyses of this study and to Dr. C. Kappagoda for his supervision during data collection, my gratitude is expressed. Association with my thesis committee has been one of great learning and personal growth.

A special thanks is due to the panel of content experts and nursing students of the pilot study for their interest and invaluable feedback on the questionnaire for this study. To the distinguished Dr. A. Antonovsky, I am most appreciative for the Salutogenic Model of Health which inspired this study and for his personal interest and encouragement provided during the developmental stages of this study.

I am particularly grateful for the friendship and support of my classmate, Eileen, along with the other students throughout the course of my graduate studies; namely, Marianne, Karran, Sharon, Shirley and Sarah.

To my family who have shared so much, my gratitude and deepest affection. Their support provided the sustaining environment from which accomplishment is made possible and without which accomplishment would mean little.

This study could not have been accomplished without the generosity of many individuals. I thank my colleagues in the Faculty of

Nursing for their encouragement and to Lee for her expert typing of this thesis. I gratefully acknowledge a Studentship from the Alberta Heritage Foundation for Medical Research, which I feel honored to have received.

Finally, I wish to express my admiration and appreciation to the men who were willing to participate as subjects in this study at a time of great personal stress for them.

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CHAPTER I

INTRODUCTION

Health and illness are universal phenomena. With increasing emphasis on health promotion, greater attention and effort are being directed toward the meaning of health and its characteristic behaviors. Instead of focusing on role behaviors of the ill, it is seen as more appropriate to begin with the human experience of health (Idler, 1979). Attention is being directed not only to the quantity but the quality of life of the individual. The task of rehabilitation may be stated as one of adding life to years not years to life.

Nursing has a strong foundation in health. Although most nursing theorists have included promotion, maintenance and restoration of health in their definitions, to date, nursing theories have largely focused on effects of illness (Henderson, 1978; Newman, 1979; Orem, 1980; Rogers, 1970; Roy, 1976; Travelbee, 1966). There is a paucity of literature by nurses on health *per se*. With the growing emphasis on self-care, nurses will be forced to look at positive health behavior and their roles in "health". If the goal of nursing is "to care for and assist individuals within society to attain and maintain health" (Philosophy of A.A.R.N.-Draft, A.A.R.N. Newsletter, 1980, p. 7), health must be defined, distinguished from "dis-ease", the subjective experience of health understood, health behaviors delineated, and a criteria for health established.

Health theorists should go beyond describing, explaining and predicting phenomena. They should specify and test the actions necessary in order to promote health (Newman, 1979). Nursing assessment is a process by which the health status of individuals is measured for purposes of determining nursing service needs. "The first step in measurement is to define health and to state its measurement parameters so as to give direction to the assessment process" (Mallich, 1979, p. 30). Therefore an operational definition of health is necessary. A model of health could be a valuable tool to identify indicators necessary to define and assess the condition of "health" as well as the factors which may produce that state. A functional definition of health should be measurable from which reasonable goals can be established. This in turn would provide a common frame of reference for health professionals to integrate services provided to individuals. As Donabedian (1976) suggests, it is a pragmatic rather than an idealistic definition of health that must be used to solve the problems related to assessment of individual needs and hence required nursing service.

Statement and Importance of the Problem

A major question underlying this study is why do some people manage to stay and feel healthy despite the ubiquity of stressors? Antonovsky attempts to answer that question through his Salutogenic Model of Health (1979). The study reported here was concerned with the measurement of a major variable in Antonovsky's model, that of "sense of coherence" (Antonovsky, 1979, p. 123). The rationale underlying this investigation is that there is a distinct need to develop reliable and valid measurement devices to explore issues and problems related to the concept of "health".

Through the development of valid tools, hypotheses relating constructs of the Salutogenic Model of Health could be tested for purposes of enhancing theory development. A valid theory of health is expected to have the potential of identifying indicators necessary to assess and promote the condition of "health". Further research activities may then evolve to enhance the categorization of knowledge and in turn, the professionalization of nursing. How health is defined determines how nurses should be educated and how they should practice.

The main objective in this investigation was to develop a scale for measuring "sense of coherence" and to establish some validity estimates for this developed scale labelled Health Coherence Attitude Scale. No operational definition was presented by Antonovsky for "sense of coherence". From the theoretical definition, the investigator attempted to operationally define "sense of coherence" in order to achieve construct validity. Based upon an extensive literature review, assumptions related to the concept of "sense of coherence" were evolved and relationships to health status were identified. A scale composed of fixed alternatives was developed to yield data which could be utilized to investigate the following questions:

QUESTION ONE

Do comprehensibility, manageability and meaningfullness emerge as factors of a sense of coherence?

QUESTION TWO

Are comprehensibility, manageability and meaningfullness correlated factors?

QUESTION THREE

Is sense of coherence a predictor of health status?

Antonovsky's model would imply that positive answers to each would be forthcoming if the operational measure employed was indeed a valid measure of the construct "sense of coherence".

Assumptions and Limitations

The conceptual model employed in this study was the Salutogenic Model of Health by Antonovsky (1979). The approach utilized in this investigation constituted an attempt to shed some light on the complex relationship between attitudes and health through exploring some of the definitional and measurement issues related to these concepts.

The specific attitude in question was "sense of coherence". As outlined in Chapter II, no previous operational definition of this construct existed. For purposes of this investigation, the measurement of sense of coherence was limited by the level of abstractness of the underlying theoretical framework and the subsequent operational definitions developed. Specifically, the concept of sense of coherence was defined *a priori* as a multidimensional trait. Consequently, the development of the Health Coherence Attitude Scale was limited by the validity of these operational definitions relevant to assumed multidimensionality (cf. Chapter II, pp. 30-40).

Several other limitations were present in this investigation. Lack of suitable criterion measures did not allow for a multitrait-multi-method design to investigate convergent and discriminant validity (Campbell & Fiske, 1967). The particular health data that were obtained about an individual were viewed as only a sample from his universe of health.

The study was restricted to male respondents with coronary heart disease, in one general hospital during a specified period of time. The relative homogeneity of subjects therefore limited the range in "health status" for this investigation. In sum, the Generalized Resistance Resources (Antonovsky, 1979, p. 99) were not randomly selected limiting the generalizability of findings beyond this subject group.

Furthermore, the limited expertise available regarding the theoretical model underlying this investigation limited the generalizability of the face and content validity estimates.

Due to the small numbers of subjects in this investigation, the power of the study was not sufficient even with a large effect size to conclusively demonstrate relationships. Interpretation of findings was therefore limited in this respect.

Theoretical application of the Salutogenic Model of Health for this study is delineated in Chapter III. Relationships between the Health status of subjects, "coronary heart disease", and the construct in question, "sense of coherence", were identified by the investigator (cf. Chapter II, pp. 80-82). While Antonovsky views a sense of coherence as prevailing over time, movement along the sense of coherence continuum is anticipated by the Salutogenic Model of Health in response to life events. Ideally an instrument should be "sensitive" to measuring a "change" in sense of coherence. All findings of this investigation are considered in view of these stated assumptions and limitations.

The Larger Significance of the Study

Scientific and technological advances are both associated with and have resulted in a society concerned with improving the quality of life. Yet despite marked expansion in expenditures and services, the actual health of people appears to have improved less than anticipated. A curative-oriented, specialized health system prevails. Broad definitions of health have resulted in a society with high expectations and resultant anxiety. Society feels "diseased". Renée Fox proposes that medical professionals have acquired a social-control function in society through the medicalization of deviance and suffering (Fox, 1977, p. 15). Illness is accepted as legitimate deviance. In contrast, the new emphases on health as a right and illness as medically and socially engendered, reflect the conceptualization of health as a consequence of the good life rather than professional medical care.

Health has evolved not as a singular, unique definition but a family of concepts. "Feelings of well-being, absence of disease, and ability to fulfill the functions of personal and social life" have always entered into the notion of health (Temkin, 1953, p. 21). The dynamic versus static nature of health is evidenced by different eras reflecting different notions as to health. Health defined as a "bottomless conceptual pit" leads to difficulties in distinguishing political, cultural, ethical and health problems (Callahan, 1977, p. 26). In determining the rights to health, our technological society has induced people to view needs and desires as one and the same. The right to health care has opened many ethical questions; the answers to which are certain to have an effect on the future conception of health (Callahan, 1977).

The concept of health has been variously defined as (1) the opposite of illness, (2) something separate and distinct from disease, and (3) constituting a continuum. Engel (1960), Parsons (1951), Romano (1950), and WHO (1958) have viewed health and illness as polar opposites, health being viewed as static and not allowing for changes over time or in-between states. In contrast, Antonovsky (1979) and Dunn (1959) view health on a continuum with illness; illness and wellness are viewed as having similar elements varying only in quantity. Jahoda (1958) and Rogers (1960) attempted to look at wellness and illness as two separate entities with each individual possessing varying components of illness and wellness with health status being the net balance of these. The conceptual clarification of health continues today. Perhaps health cannot be defined, only described.

Siegel summarizes the definitional problems of health as rooted in the following factors: (1) health is a value judgement, a condition to allow fulfillment of potential, (2) health is a subjective concept with individuals being affected by indeterminable variables, (3) health is an abstraction with different people wanting different things, (4) health lies on a continuum, (5) health is culturally determined, and (6) health is a relative concept (Siegel, 1973, p. 282). Health is a multidimensional concept and definition is a crucial antecedent to determining the way health is measured.

Although theoretical clarification of the term health is still very much underway, the literature reflects a growing emphasis upon efforts to measure health. As emphasized above, historically, health status has been defined in terms of illness, but in the last ten years measurement has been expanded to include "health" itself. To assist in the development of composite health measures, the

Clearinghouse on Health Indexes has adopted the following definition:

> A health index is a measure which summarizes data from two or more components and which purports to reflect the health status of an individual or defined group. (U.S. Department of Health and Human Services, 1978, p. 1)

Thus an "index" of health status is a specific measure of selected dimensions or "indicators" of health. Construction of a health index requires selection of the concepts to be measured, specification of operational definitions for these concepts, explication of the central underlying presuppositions, determination of the measures to be used and a method of combining them into a single index. There is much controversy around the question of what should be the major health indicators. What are the parameters of a state of health? What are the transitional probabilities for moving from one health state to another? What is the individual preference for each health state? What are the problems in developing measures of health?

In terms of coronary heart disease, pathogenesis still overwhelmingly dominates research, whether of a biological or social type. Hackett and Cassem (1978) suggest that because the inactivity of cardiac patients in depressed states receives so much attention, that fact stands as proof they are "washed up". These patients complain of lack of activity but are afraid to be more active. According to those authors, physical activity can be the most potent antidote to the mental distress of coronary convalescence. The demonstration of patients' capacity to perform progressively more activity leads to dramatic comments like "I feel better than new!"

There is some evidence suggesting that patients who exhibit a poor adaptation have a higher mortality rate than those who adapt successfully and evidence supporting the notion that the quality of life of the cardiovascular patient is improved with rehabilitation; however, there has been very little research in which a quantitatively measured improvement in "health" per se, has been demonstrated.

On the basis of the literature and her own clinical experience, it is this investigator's belief that a systematic examination of the degree to which a myocardial infarction, cardiac surgery, or a physical training program has caused a "shift" in a patient's "sense of coherence" will provide greater understanding of the patient and the specific rehabilitation programs required, and insights about monitoring patients during rehabilitation. With the high probability of depression following a myocardial infarction (Anderson, 1977; Shephard & Kavanagh, 1978) an evaluation of intervention programs must include measures of the patients' "sense of coherence", not just measures of blood pressure, exercise tolerance or vague references to "well-being". A strong sense of coherence may in turn be found to interrelate with other factors or Generalized Resistance Resources (GRRs) (Antonovsky, 1979, p. 99) such as family and social relationships, work, self-esteem, life-style and general health behaviors and attitudes.

Additionally, it can be argued that with the increasing cost of medical care, there is a demand to be accountable for effectiveness of rehabilitation programs. Although various physiological benefits have been studied, the comprehensive effects of rehabilitation programs have not been well established. This investigator's review of the literature on rehabilitation programs for the post-myocardial infarction patient suggests that three key questions have yet to be answered: (1) do patients on a supervised rehabilitation program live longer, quantitatively and qualitatively; (2) are there fewer recurrences of myocardial infarctions with the rehabilitation group; and (3) what is the nature - physiological, psychosocial, or both - and extent of differences between rehabilitation and control groups?

The way the patient may define his own functioning capacity, especially in terms of daily activities, may define what he *does*. But a salutogenic orientation suggests that health professionals should work with patients to engage in goal-orientated behavior that promises success within the individual's *value* framework. It is a premise of the Salutogenic Model that rehabilitation programs, if characterized by consistency, meaningful outcomes and a manageable level of stimuli, would increase the sense of coherence of its participants. In turn, the stronger the sense of coherence of individuals, the more adequately they will cope with stressors in everyday life and maintain or improve their positions on the health ease/dis-ease continuum.

In sum, determining what effects a rehabilitation program has in shaping or re-establishing a sense of coherence has far reaching implications for the further conceptualization and measurement of health. More specifically, measuring post-myocardial infarction patients' responses on the basis of "conceptualizing the process as disintegration and reintegration of a sense of coherence via concern with life experiences, provided by GRRs" (Antonovsky, 1979, p. 202) may open the way for improved intervention.

Sequence of the Presentation

This study is presented in the following manner. Chapter II contains an outline of the Salutogenic Model of Health, which constitutes the theoretical framework for this study. The pertinent literature in relation to the evolving conceptualization of health, the status of health indicators and the evidence relating sense of coherence to health is reviewed in Chapter III. Chapter IV entails a description of the design of the study and a discussion of the research instrument; a presentation and discussion of the research findings are the foci in Chapter V. Research implications and a summary of the study are presented in Chapter VI.

CHAPTER II

CONCEPTUAL MODEL

Parallel to the growing interest in nursing research, there has been increasing emphasis on theory development. A theory, as defined by Kerlinger, is "...a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena" (Kerlinger, 1973, p. 9). Theory consists of constructs into which all factors relevant to a phenomenon can be fitted. Through theory, a multitude of facts are organized into a meaningful whole by providing a systematic view of a phenomenon by specifying the relationships within the phenomenon. This permits understanding, prediction and control (Kerlinger, 1973). Ultimately, a theory is a set of propositions or theoretical statements (Hage, 1972, p. 172). Theory provides a framework which interrelates concepts relevant to the discipline and orders knowledge (Dickoff & James, 1968; Duffey & Mullenkamp, 1974). All theories require a definitional premise: what must be done; a mechanistic premise: how it can be done; an action premise: how it will be done; and an operational premise: how it will be measured (Hage, 1972, p. 167).

Theory building begins with a search for theoretical concepts to describe the phenomenon of concern. Concepts constitute the basic elements of a theory. Jacox (1974) describes concepts as "abstract representations of reality that indicate the subject matter of theory" (p. 5). Propositions interrelate the concepts (Hardy, 1974) and hypotheses thus aid in the prediction, explanation, understanding and control of outcomes. Looked at another way, concepts and hypotheses "build" theories, conceptual frameworks invented to some purpose (Dickoff & James, 1968). As a precursor of theory, a model provides the structure and content, a conceptual representation of reality.

The more abstract and clearly defined a concept is, the greater the range of phenomena it can describe. Ellis states that the "broader the scope of the theory in ordering observations and relating a variety of concepts, the greater the significance of a theory" (Ellis, 1968, p. 219). In order for theory to be prescriptive in guiding practice, relevant concepts must be related by propositions. Dickoff and James relate four levels of theory development, from factor-isolating to situation-producing (Dickoff & James, 1968, p. 200).

To generate testable hypotheses, concepts must be operationally defined. A theoretical definition provides meaning or plausibility whereas an operational definition provides measurement or testability. An operational definition is defined by Hage as "a set of indicators with rules as to how they are to be combined into an index" (Hage, 1972, p. 68). Factor analysis is helpful in this type of definition, in terms of the underlying assumption that if the indicators correlate they are measuring the same thing.

The essential elements of a theory are therefore scope, adequacy of explanation, precision of prediction, parsimony, testability and its contribution to understanding (Dickoff & James, 1968; Duffey & Mullenkamp, 1974; Ellis, 1968; Hardy, 1974). Analysis and testing of any theory is prerequisite to application of theory if the purpose is to describe, explain, predict and guide practice.

Theory development may be approached inductively and deductively; often it is a combination of the two. The deductive approach begins with generalizations and proceeds to the specifics of the theory; the inductive approach begins with specific description and measurement and proceeds to the building of unique theory. In the following section, Antonovsky's model will be examined from the standpoint of theory constituting a set of verified, interrelated concepts and statements that are testable (Jacox, 1974, p. 8).

Central Components of the Salutogenic Model of Health

Considering the ubiquity of stressors - physical, chemical, microbiological, social, cultural and psychological - how does one get and stay healthy? Antonovsky (1979) offers an approach to how people deal with the inevitability of stress in everyday life and proposes a health ease/dis-ease continuum for studying salutogenesis - "the origins of health" (p. 12). The key concept in Antonovsky's Salutogenic Model of Health is a "sense of coherence", which he defines as "a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable and that there is a high probability that things will work out as well as can be reasonably expected" (Antonovsky, 1979, p. 123). In his view, health is not only a dependent variable, but also an independent variable linked to factors of well-being in other areas of life.

A salutogenic approach compels one to examine subjective as well as objective interpretations of the health state, to consider multiple causation and to avoid conceptualizing in terms of qualitative dichotomous states of disease and nondisease. Antonovsky conceptually defines health ease/dis-ease as a continuum of multifaceted states of the human being (Antonovsky, 1979, p. 64). He operationally defines four facets of the health ease/dis-ease continuum as pain, functional limitation, prognostic implication, and action potential (Antonovsky, 1979, p. 65). The salutogenic orientation is concerned with understanding factors involved in movement on the continuum or maintenance of the current position, rather than how to reach perfect health.

Antonovsky first hypothesizes that the presence and level of stressors subjectively and objectively defined explains movement on the health ease/dis-ease continuum (Antonovsky, 1979, p. 70). However, on the basis of empirical evidence, he later rejects this hypothesis and hypothesizes that it is not the type or number of stressors which are important but successful tension management. Stressors are omnipresent and defined as "a demand made by the internal or external environment of an organism that upsets its homeostasis, restoration of which depends on a nonautomatic and not readily available energy expending action" (Antonovsky, 1979, p. 72). Antonovsky outlines the sources of stressors to be: physical and biochemical, and psychosocial stressors such as accidents and survivors, others' experiences, horrors of history, intrapsychic fear of agression, immediate world and change, phase-specific crises, normative crises, conflicts in social relations, and goals-means gap (Antonovsky, 1979, p. 89). Tension is distinguished from stressors as the "response of the organism to stressors - positive and/or negative" (Antonovsky, 1979, p. 94). Stress is consequently the state of the organism in response to the failure to overcome stressors and manage tension (Antonovsky, 1979, p. 95). Antonovsky thereby postulates that tension may be salutary; stress contributes to pathogenesis. The salutogenic question may then lie in successful tension management, i.e., in the "rapidity and completeness with which problems are resolved and tension dissipated" (Antonovsky, 1979, p. 96). The question is, what are the determinants of successful tension management?

Some of the answers are found in Generalized Resistance Resources (GRRs), "any characteristic of the person, group or the environment that can facilitate effective tension management" (Antonovsky, 1979, p. 99). Specific Resistance Responses (SRRs) are often due to luck or chance, and it is the GRRs that make SRRs available to us (Antonovsky, 1979, p. 99). From findings in medical sociology, psychiatry, ego psychology, and cultural anthropology, Antonovsky outlines the kinds of GRRs: genetic and constitutional, and psychosocial, including material goods; knowledge, intelligence; ego identity; coping strategy: rational, flexible, farsighted; social support, ties; commitment: continuous, cohesion, control; cultural stability; magic; religion, philosophy, art; a set of stable answers; and a preventative health orientation (Antonovsky, 1979, p. 103). A GRR refers to dealing with and overcoming stresses, in effect "coping", not resorting to a holding action. Coping is a plan for behavior, "not the behavior that eventually results in coping with the stressor" (Antonovsky, 1979, p. 113). GRRs are interchanged in managing tension and Antonovsky postulates that the absence of GRRs is in itself a stressor.

The "extent to which our lives provide us with GRRs is a major determinant of the extent to which we come to have a generalized, pervasive orientation" (Antonovsky, 1979, p. 122). GRRs facilitate attaching meaning to the countless stimuli bombarding us and generate a strong "sense of coherence" (Antonovsky, 1979, p. 123), a general orientation in which one sees life as meaningful, manageable and comprehensible. Antonovsky maintains that this is the crucial variable in explaining movement along the health ease/dis-ease continuum. Therefore, in the salutogenic orientation, one engages in goal-directed behavior to strengthen one's sense of coherence - a striving for consistency, generalization, stability and continuity. The "sense of control" does not imply internal control in the sense of "I am in control" but rather a total behavior pattern in the sense of "things are under control" (Antonovsky, 1979, p. 128). Antonovsky explores childrearing, social-structural, cultural and historical sources of GRRs that foster a strong sense of coherence. If life experiences foster consistency, participation in shaping outcome, and a balance between underloading and overloading events, a strong sense of coherence develops. How does the coherence continuum relate to the health ease/dis-ease continuum?

A sense of coherence offers a parsimonious explanation of health. Antonovsky provides evidence supporting its relationship to health through social, cultural, psychological and situational variables. Antonovsky hypothesizes that "given the same life event scores, people with different strengths of coherence manifest different health outcomes" (Antonovsky, 1979, p. 177). A strong sense of coherence mobilizes resources to cope with the adaptive demands of life changes; whereas a weak sense of coherence meets the adaptive requirement with a sense of helplessness, the change does not make sense.

The Salutogenic Model is depicted in Figure 1. Life experiences shape the sense of coherence (Arrow A). An underlying assumption is that to develop a strong sense of coherence, experiences must not only be predictable, but rewarding, yet with some measure of frustration and punishment. The sense of coherence is also a function of there being an overload-underload balance of stimuli. In the advent of a stressor, life experiences are transformed through a change in one's Generalized Resistance Resources (GRRs, see Arrow B) which in turn alter the sense of coherence. The stressor may be a planned change in movement along the coherence continuum or it may not be of choice and/or involve preparation. As life experiences shape the sense of coherence, in turn life experiences are shaped by the effects of stressors (Arrow B) and to a greater extent by one's generalized resistance resources (Line C). The GRRs "provides one with a meaningful set of coherent life experiences" (Antonovsky, 1979, p. 189). To date, no specific research has been reported which is aimed at testing the relationships between GRRs and the sense of coherence. A

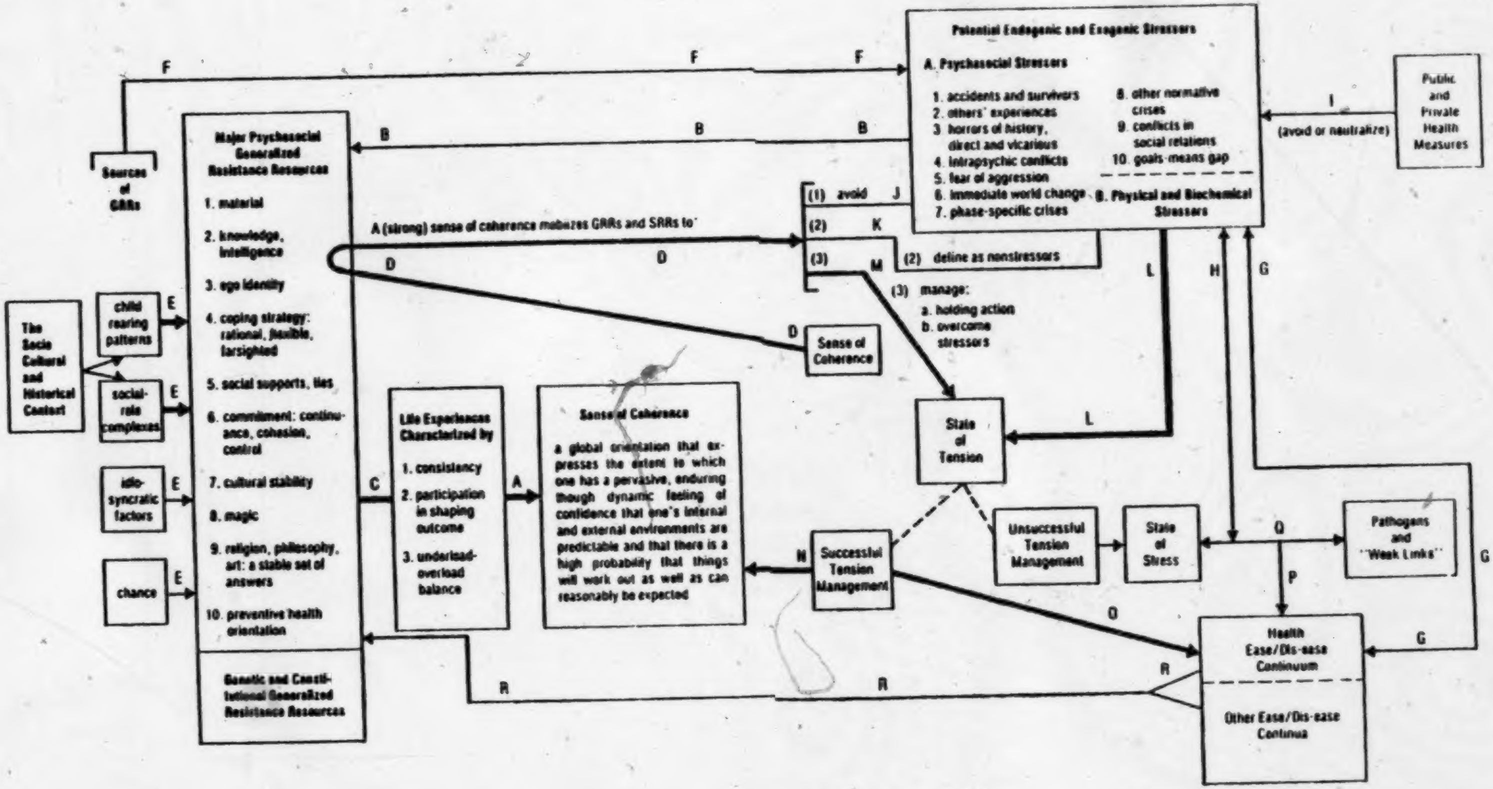
F
F
F
B
B
B
Sources of GRRs
The Socio Cultural and Historical Context
child rearing patterns
social-role complexes
idio-syncratic factors
chance
E
E
E
E
Major Psychosocial Generalized Resistance Resources
1. material
2. knowledge, intelligence
3. ego identity
4. coping strategy: rational, flexible, farsighted
5. social supports, ties
6. commitment: continuance, cohesion, control
7. cultural stability
8. magic
9. religion, philosophy, art: a stable set of answers
10. preventive health orientation
Genetic and Constitutional Generalized Resistance Resources
A (strong) sense of coherence mobilizes GRRs and SRRs to:
D
D
D
C
Life Experiences Characterized by
1. consistency
2. participation in shaping outcome
3. underload-overload balance
A
Sense of Coherence
a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that one's internal and external environments are predictable and that there is a high probability that things will work out as well as can reasonably be expected
Sense of Coherence
(1) avoid
J
(2)
K
(3)
M
(2) define as nonstressors
(3) manage:
a. holding action
b. overcome stressors
Potential Endogenic and Exogenic Stressors
A. Psychosocial Stressors
1. accidents and survivors
2. others' experiences
3. horrors of history, direct and vicarious
4. intrapsychic conflicts
5. fear of aggression
6. immediate world change
7. phase-specific crises
8. other normative crises
9. conflicts in social relations
10. goals-means gap
B. Physical and Biochemical Stressors
I
(avoid or neutralize)
Public and Private Health Measures
L
L
H
G
G
G
State of Tension
Successful Tension Management
N
Unsuccessful Tension Management
State of Stress
Q
P
Pathogens and "Weak Links"
O
Health Ease/Dis-ease Continuum
Other Ease/Dis-ease Continua
R
R
R

Figure 1. The Salutogenic Model of Health

Note. From Antonovsky, A. Health, Stress and Coping. San Francisco: Jossey-Bass, 1979, p. 184-185. Copyright 1979 by Jossey-Bass Inc. Publishers. Reprinted by permission.

strong sense of coherence mobilizes the GRRs and Specific Resistance Resources (SRRs) at one's disposal (Arrow D). Childbearing patterns, social role complexes, idiosyncratic factors and chance build up GRRs (Arrow E). However, there is also a direct link between sources of GRRs and Stressors (Arrow F). For example, different societies have different stressors and therefore different GRRs, accounting for significant individual differences in GRRs not only within groups but between groups.

Stressors have a three-fold power. The impact of psychosocial stressors is mediated through GRRs and the sense of coherence (Arrow B). Biochemical and physical stressors may bypass the sense of coherence and act directly on health status, yet in turn the health status can affect the extent of exposure to psychosocial stressors (Two-way causation - Arrow G). Thirdly, physical and biochemical stressors interact with weak links and endogenic pathogens and with stress to affect health status (Interaction - Arrow H).

In this framework, health measures are seen as acting to avoid or neutralize stressors (Arrow I). However other factors in tension management also come into play. A sense of coherence works in three ways: 1) by mobilizing the GRRs and SRRs (Arrow D), a strong sense of coherence can act to avoid stressors (Line J); 2) a strong sense of coherence can mobilize GRRs and define stimuli as nonstressors (Line K); and 3) a strong sense of coherence, mobilizing GRRs and SRRs can interact with the state of tension and manage a holding action and ultimately overcome the stressors (Arrow M).

We are constantly bombarded by stressors, which puts us in a state of tension (Arrow L). Therefore, GRRs have a dual role: an active function, in creating life experiences that produce a strong sense of coherence; and a protective function, in managing tension by overcoming stressors ("crucial role"). Overcoming a stressor and resolving tension strengthens the sense of coherence (Arrow N). In turn, successful tension management helps one maintain one's place on the health ease/dis-ease continuum (Arrow O). If tension management is successful, by reinvigorating our sense of coherence (Arrow N), we would maintain our easeful health status (Arrow O). If the interaction between the state of stress, pathogens, and "weak links" is unsuccessful, a state of stress results and there is movement to the dis-ease part of the health ease/dis-ease continuum (Arrow P). Only when there is stress as a general precursor, interacting with existing pathogens and "weak links", does stress and dis-ease health status result (Arrow Q). The essential health problem is then one of preventing tension from becoming stress or, to pose that problem in salutogenic terms, what factors facilitate a person's remaining at his or her level on the health ease/dis-ease continuum or moving up? (Antonovsky, 1979, p. 196).

Health can first affect the extent to which one is exposed to stressors (Arrow G); it can in itself be a GRR; and thirdly, it can facilitate the acquisition of other GRRs (Arrow R). Therefore, location on the health ease/dis-ease continuum can be viewed as a GRR, which can shape life experiences to strengthen the sense of coherence which in turn mobilizes other GRRs to manage tension, which in turn strengthens the sense of coherence, which in turn moves one up on the health ease/dis-ease continuum.

As such, health and GRRs can be viewed as independent variables which can affect the dependent variable, sence of coherence, which in turn can affect the now dependent variables of GRRs and health. Antonovsky's Salutogenic Model of Health will be examined in relation to the criteria of scope, adequacy of explanation, precision of prediction, parsimony and testability.

Scope of the Model

The significance of a theory lies in the breadth of the phenomena described (Ellis, 1968). On a continuum from grand theory to proposition theory, Antonovsky's Salutogenic Model of Health could be placed between grand and middle range in terms of the scope of phenomena described. Through a research based examination of how people deal with the inevitable stresses of everyday life, Antonovsky notes that there are differences in abilities to manage stress and maintain health. From the disciplines of psychology, psychiatry, sociology and cultural anthropology, Antonovsky develops a theory to explain the success of people and groups in coping with stress. Most of these people share a sense of coherence, a general orientation that life is meaningful, manageable and comprehensible. These dimensions of sense of coherence are shaped through psychological, social and cultural life experiences. Sense of coherence is conceptualized on a continuum being shaped, tested and reinforced throughout life (Antonovsky, 1979, p. 125).

The origins of health are considered to be found in the sense of coherence. Sense of coherence is therefore linked to health.

A strong sense of coherence meets demands of life through mobilizing GRRs and SRRs, defining stimuli as non-stressors, avoiding stressors and overcoming stressors (Antonovsky, 1979, p. 185). Sense of coherence is conceptualized as a pervasive, enduring, though dynamic attitude encompassing both affective and cognitive domains and obviating time boundaries in the past, present and future. Additionally, sense of coherence is contrasted with ego identity in that sense of coherence includes the picture of oneself in the total picture of one's world (Antonovsky, 1979, p. 110). Although broad in scope, the concept of sense of coherence provides structure to the perception of stimuli. It is not situation or role specific. All life experiences shape sense of coherence which in turn aid in meeting the demands of life. Sense of coherence is not necessarily seen as "good" in itself, but compatible with other types of personal and social order (Antonovsky, 1979, p. 157).

Stimuli are broadly defined by Antonovsky as material, abstract, and personal from one's internal and external environments. Stimuli perceived also encompass the individual, primary group and societal referents. Stressors in turn are broadly conceptualized as subjective by postulating that there is a wide sphere of consensus about what would be perceived as a stressor by human beings. Antonovsky describes a wide variety of stressors from biological and genetic, psychosocial and cultural, through to catacylysmic phenomena (Antonovsky, 1979, p. 85). However, Antonovsky's major thesis is that stressors are omnipresent and therefore the amount or type is inconsequential in explaining movement on the health continuum. The solution lies in the salutary effects of successful tension management. The consequence of stressors lies in the perception of the meaning of the event rather than the objective character (Antonovsky, 1979, p. 76). The hypothesis is then formulated that given the same life event scores, people with different strengths of coherence manifest different health outcomes (Antonovsky, 1979, p. 77).

The determinants of successful tension management lie in the extent to which GRRs provide life experiences that foster the sense of coherence. These building blocks of sense of coherence broadly encompass varied dimensions of genetic and constitutional resources, psychosocial and cultural resources, as well as SRRs such as luck (Antonovsky, 1979, p. 103). GRRs are therefore linked to each other and to sense of coherence and ultimately to health. Antonovsky depicts health as a system of conceptual classification not related to specific diseases but as a concept which unifies all states on a health-illness continuum. This approach avoids the pitfalls of the "one cause" explanation of disease through the realization of the multiple phenomena involved. In this perspective, and as emphasized above, health is viewed on a continuum consisting of four facets (Antonovsky, 1979, p. 59). These generalized factors are relevant to all diseases, thereby health is conceptualized as multidimensional and not absolute. To avoid focusing on illness and disregarding the subjective interpretation of sickness, the clinical definition of health is replaced with the question of how one can move toward the healthy end of the continuum, however defined.

Antonovsky is concerned with movement up the health continuum and not in explaining how to reach "perfect health". Seeking a definition of positive health is viewed as too utopian. Although Antonovsky provides a quantitative, negative index of health, he maintains that his approach overcomes the problem of a lack of a definition of bad, average, or good health. Complete health, rather than the state of breakdown, is viewed as being statistically deviant. Therefore, the answer is seen as that of salutogenesis. Salutogenesis compels one to examine everything of importance to people who are ill, including subjective interpretations of their state of health. Creating a dichotomy between health and illness is not reality. All sickness is not disease or the absence of health. Additionally, what maintains health goes beyond the "one-bullet" approach.

Pathological consequences emerge when stress interacts with pathogens. Antonovsky's health indicator is based on the physiological realm, with low breakdown being considered as healthy. Other health indicators such as mental health and social health are viewed as other realms of well-being, therefore, health as underlined above, is viewed as a dependent variable linked to well-being in other areas of life which should be measured separately. To consider all other social indicators together in one overall definition of health only serves to confuse the issue. Antonovsky postulates that the social realms interact but one must examine this interaction. Additionally, does sense of coherence contribute to health in other realms? With patients being viewed as persons in a social situation, with the past being relevant to current and future health, people are therefore not only on a health continuum, but on social, psychological, functional continua as well. Different subculture groups do show different patterns of breakdown. Consequently, health is not viewed as the only major value of society, concomitantly a strong sense of coherence not necessarily being good in itself.

Health as an independent variable is also proposed by Antonovsky. Health can affect the extent to which one is exposed to stressors, can act as a GRR, and can facilitate acquisition of other GRRs. With health interacting in all realms of life, the Salutogenic Model provides an abstract, conceptual level of knowledge and it permits description of a wide set of phenomena.

Adequacy of Explanation of the Model

Antonovsky outlines general concepts and develops the substantive structure of each conceptual element comprising the general concept. Symbolization is introduced and terms are defined. Antonovsky employs complex concepts which result in problems of individual interpretation. The stumbling block is not in the concepts themselves, but in abstract theoretical definitions. Health and disease are outlined; both elements are then used to support the measurement of health on a continuum. A differentiation between tension and stress is accomplished leading to the generalization that tension can be salutogenic, stress being pathogenic. With this assumption made, GRRs are introduced as a means of providing one with the pervasive orientation of a sense of coherence. Additionally, Antonovsky provides direct and indirect evidence supporting the relationship between the central concept of a sense of coherence and health status.

Complex theories of social support, ego identity, coping strategies, locus of control, developmental tasks, childrearing patterns and subcultural and cultural patterns of organization are drawn upon to provide support and evidence for the central concepts defined. The underlying assumptions linking these concepts to formulate the Salutogenic Model are proposed by Antonovsky and supported by evidence both directly and indirectly from several disciplines (Antonovsky, 1979, p. 163-181).

Within the concept of health, the four facets are defined broadly. Are pain, functional limitation, prognostic implication and action potential inclusive of the multidimensions of physical health? Is the internalized expectation of personal health states a reliable measure of health? Should each facet be weighted? With allowing for a personal decision in action implications can you say inaction is healthy? What ethical issues arise? With prognostic implications, what effect on health is there to one who denies the presence of danger to life? What is the relationship of physical well-being to mental and/or social well-being?

With the concept of GRRs, distinction is not apparent as to how the GRRs relate to one another. Are they weighted equally? Are they summative or hierarchical? What implications do different combinations of GRRs have for sense of coherence and hence for health? All GRRs are not specifically defined. What are the characteristics that make a GRR a GRR? Within the concept of sense of coherence, the meaningful, manageable and comprehensible factors are not explicitly defined. Is each factor weighted equally? Can one have comprehensibility without meaningfulness? Indeed, is sense of coherence a unidimensional or multidimensional trait? What implications do different combinations of the three factors have for health? What are the subsequent behaviors which promote health? Should conflict and mobility be preferred over coherence? Thus the question arises, what are the salutary experiences which may have the potential of calling up one's resources and enriching one's repertoire?

Precision of Prediction of the Model

In order for theory to be prescriptive in guiding practice, relevant concepts should be related by propositions. Antonovsky is descriptive in citing and defining concepts; propositions or specific relationships between two or more concepts are evident. The core propositions of the Salutogenic Model are:

> Life experiences shape the sense of coherence. By definition, a GRR provides one with sets of meaningful, coherent life experiences. A strong sense of coherence mobilizes the GRRs and SRRs at one's disposal. Childrearing patterns, social role complexes, idiosyncratic factors and chance build up GRRs. Ubiquitous stressors create a state of tension. The mobilized GRRs (and SRRs) interact with the state of tension and manage a holding action and the overcoming of stressors. Successful tension management strengthens the sense of coherence. Successful tension management maintains one's place on the health ease/dis-ease continuum. (Antonovsky, 1979, p. 186)

Assumptions and conceptual relationships should be explicitly stated. For proposition statements, variable concepts are necessary. Antonovsky has explicitly defined health as a dependent and independent variable.

However, relationships within the larger constructs of GRRs and sense of coherence are only implicit. For example, can one GRR be substituted for another in managing tension? Because Antonovsky has a set of related concepts, one can begin formulating hypotheses and testing how the Salutogenic Model fits empirical reality.

Parsimony of the Model

The more abstract and clearly defined a concept, the greater the range of phenomena it describes. Antonovsky's concepts, although complexly defined, provide descriptions of a variety of phenomena. Phenomena from the psychological, social, and cultural dimensions are skillfully interrelated to the central concepts. The breakdown concept allows for identification of high risk groups in a parsimonious manner. As a theory should be as inclusive as the phenomena it is aimed at describing, a concept as broad as salutogenesis is therefore helpful in explaining as complex a phenomenon as man is himself. Antonovsky generates multiple predictions with very few assumptions. Coherence would seem to offer an extremely parsimonious explanation of health.

Testability of the Model

To generate testable hypotheses, concepts must be operationally defined. Operational definitions allow measurement of theoretical concepts (Hardy, 1974, p. 105). Concepts must be sufficiently well defined to allow for empirical testing. Antonovsky provides a "mapping sentence" definition of health. These definitions provide guidelines for operationalizing the concept (Antonovsky, 1979,

p. 65). The four facets of health are still very abstract but they are purposely defined so as to permit subjective measurement of the definition. With GRRs, a broad mapping sentence is again provided (Antonovsky, 1979, p. 103). However, no specific operational definition of each factor is provided to aid in measurement. Internal relationships of subconcepts are not explicated in such a way as to yield testable hypotheses at this point.

No operational definition is presented by Antonovsky for sense of coherence. In this study the investigator attempted to identify assumptions related to the concept of coherence. The establishment of construct validity is a crucial step in developing an appropriate measurement instrument for "sense of coherence" at this time. An operational definition was attempted in order to achieve construct validity.

Operational Definition of Terms

Based upon an extensive literature review of related concepts and the preceeding analysis of Antonovsky's model, the investigator first developed operational definitions. The following are definitions of terms used in this study.

> *Sense of Coherence is an enduring attitude reflecting the degree to which one perceives stimuli to be comprehensible, meaningful and manageable.*

Sense of coherence as an attitude is conceptualized as a learned predisposition to respond positively or negatively to certain objects, situations, concepts or persons.

Attitudes possess cognitive and affective components. Attitude is characterized by "affect which refers to a person's feelings toward and evaluation of some object, person, issue or event" (Fishbein & Ajzen, 1975, p. 12). Attitudes are distinguishable from interests, opinions and beliefs. Interest is limited to a moral judgement concerning one's own activities. Opinions are less generalized and more cognitive than attitudes. Beliefs are based on information believed to be fact and are less pervasive and less resistant to change than attitudes and opinions. Closely related to one's attitudes are the values one holds. Values refer to the importance or worth attached to stimuli. Although attitudes, interests, opinions, beliefs and values are all motivators of behavior and characteristics of personality, values are basic to the expression of attitudes (Aiken, 1980).

Therefore, sense of coherence is learned and acts as a behavior guide allowing for response consistency. Similar to the goals of science (Roberts, 1980), a sense of coherence provides a perspective from which to interpret stimuli: to explain, to predict and to control. Sense of coherence is not situation or role specific. The referent of sense of coherence "is not this or that stressor, or this or that area of life, this or that problem or situation, or this or that time" (Antonovsky, 1979, p. 124). Self-conception in itself is the sum of concepts used to describe one's self (Gordon, 1969), whereas a sense of coherence attitude is a way of looking at the world and one's life in it. As a crucial element in one's basic personality structure, sense of coherence influences one's capacity to judge reality. Interacting with GRRs, a strong sense of coherence assists one in meeting the demands of life. Life experiences continually shape, test and reinforce the sense of coherence throughout life. Mastery of feelings of helplessness and hopelessness, along with role complexes fostering flexibility, self-direction and choice, as well as cultural clarity and consistency, influence the development of a sense of coherence attitude.

Changes occur around a stable location on the coherence continuum. There is a "constant albeit dynamic tendency toward consistency, stability and continuity" (Antonovsky, 1979, p. 125). Thus a sense of coherence is characterized by endurance. Sense of coherence can "collapse" with changes in GRRs. However, one tends to choose situations that reinforce one's sense of coherence and those in turn may modify it. Because sense of coherence as an attitude applies over time, it obviates time boundaries related to past, present and future. That is, a prevailing attitude has the unstated expression of having always prevailed, of prevailing now and the "promise" of prevailing without end, even though it in fact may only prevail for a limited time.

Sense of coherence is "perceptual with both cognitive and affective components" (Antonovsky, 1979, p. 124). Therefore, sense of coherence involves perception. Perceiving a stimulus involves a cognition regarding that stimulus and the affect it arouses. An information processing approach is viewed as underlying the formation of a "coherent attitude". Specifically, a person's attitude toward a stimulus is based on his beliefs about that stimulus (Fishbein & Ajzen, 1975, p. 14). Beliefs refer to the "cognition" or information one has about the stimulus (Fishbein & Ajzen, 1975, p. 12). The conceptual framework outlined by Fishbein and Ajzen (1975) is useful in differentiating beliefs from attitudes, intentions and behaviors. According to their paradigm, beliefs influence attitudes and attitudes influence beliefs. Attitudes influence intentions which in turn influence behaviors. And, according to their framework, behaviors influence beliefs.

One may experience degrees of sense of coherence on a continuum from low to high. At the weak extreme of the coherence continuum, life is accidental, chaotic and random; a paranoid view predominates, with things always happening against one. No motivation to engage in life or caring about what goes on in life is experienced. At the opposite extreme, a "fake" sense of coherence is characterized by a "contention that all problems have an answer, when doubt or challenge is intolerable, when there is no flexibility to adapt to changing circumstances, when one claims to be in control of all things or to understand everything, when there is a denial of sadness, and when there is an incapacity to admit to the uncontrollable" (Antonovsky, 1979, p. 159).

> *Stimulus is considered a specific object of the organism's attention or response pattern.*

The classes or types of stimuli are: (1) material, (2) personal, and (3) abstract. The source of stimuli is the environment, perceived to be either internal or external. The stimulus referent may be oneself, primary group or secondary group (Correspondence, Antonovsky, August, 1980). Examples of stimuli types are: (1) material - physical strength and energy, material resources; (2) personal - knowledge, intelligence, body image, dependence, personality, coping strategy, social supports, feelings, interpersonal style, interests, concerns; and (3) abstract - hope, trust, justice, creativity, freedom, security.

Factors comprised in sense of coherence are comprehensibility, manageability and meaningfulness which are considered 'beliefs' about the stimulus.

A belief refers to cognition or the information one holds about a stimulus which discloses the characteristics one does or does not attribute to the stimulus (Fishbein & Ajzen, 1975, p. 12), for example, the degree to which one attributes to a stimulus the property of being comprehensible, manageable and meaningful. The "belief strength" is measured along a "dimension of subjective probability" involving an object and related attributes (Fishbein & Ajzen, 1975, p. 12). All attributes are perceived to be present in degrees from 0 percent (not present) to 100 percent (totally present). See Figure 2 for a visual description of the multidimensions of a sense of coherence.

Factor of Comprehensibility is a belief that life is structured.

Within this belief life is not random, chaotic or accidental. It is consistent and orderly or, with reference to the future, life is predictable. However, there is no denial or trauma which has occurred.

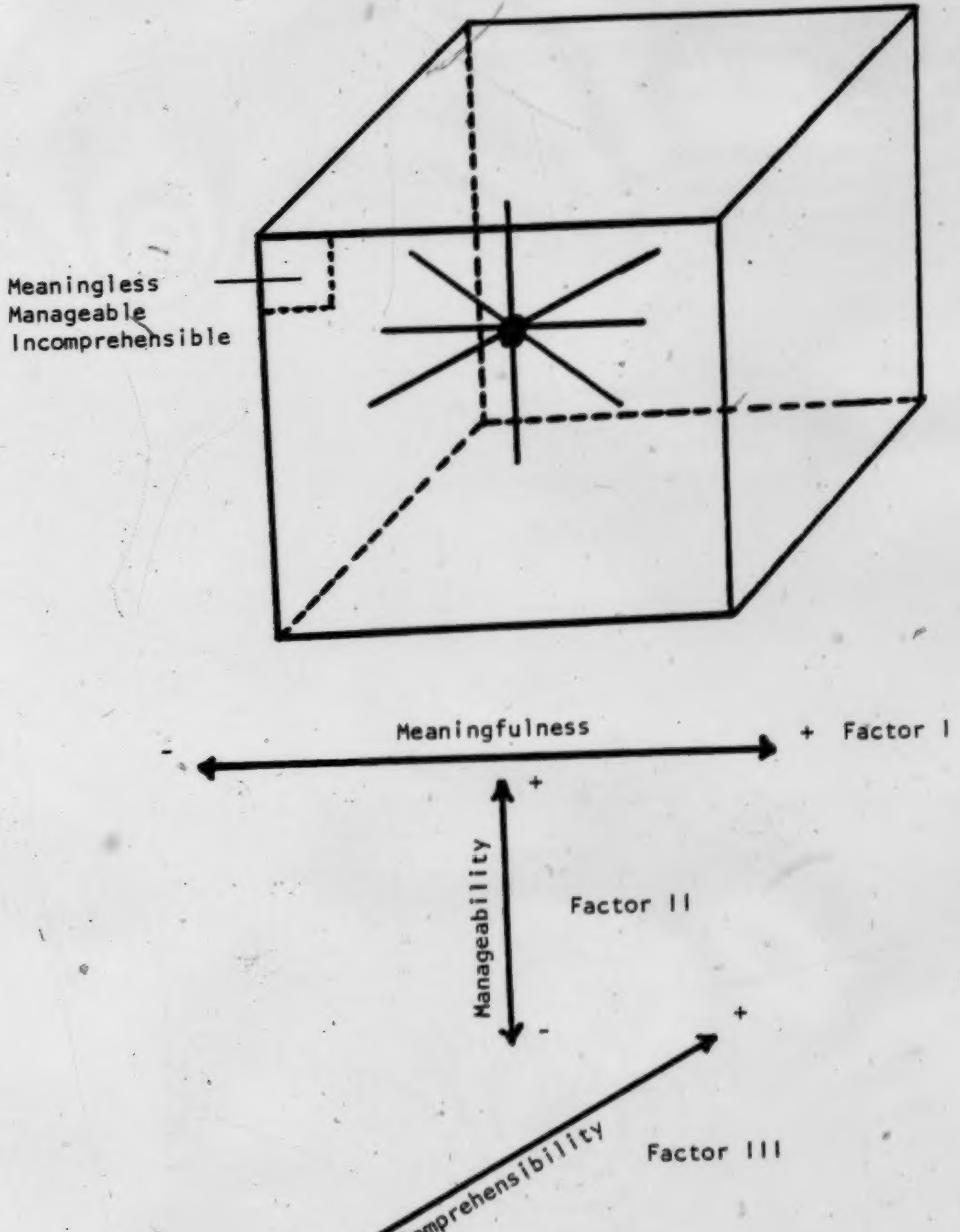

Figure 2. Coherence Visualized in Three Dimensional Space

People set boundaries in organizing their world. Within the scope of the boundaries, life is ordered and consistent. Disorderly events may occur outside the boundaries, but since there is no affective investment in them, the overall view is not disturbed. "Successful giving up" means putting stimuli outside the boundaries without denial or rationalization, and with sadness and memory (Correspondence, Antonovsky, August, 1980; January, 1981). Attributes of comprehensible stimuli are understandability, predictability, orderliness, consistency, stability, making sense of, standing to reason, and understanding the reasons. This belief influences the attitude of coherence which in turn would influence the behavior of classifying, identifying, predicting, planning, consistency of reaction and attending to objects of awareness.

Factor of Manageability is a belief that life is manageable and 'under control'.

Life can be seen as consistent, but consistently unmanageable. Life does pose problems which cannot be ignored. But for these there are options, at the least, a bearable solution. This belief is the underload-overload balance facet. Somehow, one will be able to manage. Through one's resources, or through expert help, or with the help of a legitimate authority, such as God, the worst that can happen is that one will learn to live with a problem. Therefore, this adaptation may be rooted in a strong internal locus of control (Rotter, 1966), but this is only one avenue. External avenues besides involving a faith in God can include faith in competent experts. Through developmental tasks, trust develops, which aids in generating a faith that life is controllable (Erickson, 1963). At the weak end of the coherence continuum, "they" are plotting against me. At the opposite extreme, things do not "just happen"; everything can be controlled (Correspondence, Antonovsky, August, 1980; January, 1981). Attributes of stimuli are regarded as acceptable, controllable, balanced in demands, solvable and bearable. This belief influences the attitude of coherence which in turn influences the behavior of strategy generation through withstanding, adjusting, adapting, changing self or environment and problem solving.

Factor of Meaningfulness is a belief that life is worthwhile and rewarding.

For life to be meaningful, one must care about what goes on in life and wish to engage in it. Whatever has been included within the scope of boundaries set, is meaningful to one. One cares enough to invest energy in involvement, has a sense of commitment and believes that life is worthwhile. There is a firm rejection of seeing onself as a 'sad sack'. There is participation, involvement and meaningfulness to life as it goes on, even when 'not nice' things happen. This is the subjective, motivational element of coherence. At one extreme, the 'sad sack' finds no value to life, no involvement, while the opposite finds personal significance to everything in life (Correspondence, Antonovsky, August, 1980; January, 1981). Attributes of meaningful stimuli are useful, rewarding, valuable, worthwhile of personal significance. This belief influences the attitude of coherence which in turn influences behavior of goal selection in terms of standard of conduct, taking informed action in relation to evaluating outcomes, and expending energy in relation to living.

> *Health is 'any state or condition of the human organism that is felt by the individual to be painless, not limiting for the performance of life activities self-defined as appropriate, not defined as an acute or chronic condition, and not requiring particular health-related action' (Antonovsky, 1979, p. 65).*

Health is a multifaceted continuum. Dis-ease is breakdown. Physical health is one aspect of well-being. Other realms of well-being are mental and social health. Health is a subjective criterion with movement along the continuum being closely related to who defines the situation. The four facets of the health ease/dis-ease continuum: pain, functional limitation, prognostic implications and action potential, are general and relevant to all diseases. The internalized expectations of the personal health state are used to determine the person's health status. The origins of health are found in a sense of coherence.

> *Cardiorespiratory Fitness Index based on a submaximal exercise test is a valid, quantifiable measure of physical fitness in patients with heart disease (Kappagoda, Linden & Newell, 1979).*

Physiological measurements made during an exercise test relate the magnitude of response to the work imposed. The amount of aerobic work which the body performs can be measured in terms of oxygen consumption (VO_2). The more work an individual performs, the higher will be his energy demand, and therefore, the greater the amount of oxygen consumed. With increasing energy expenditure, there is a normal increase in heart rate, blood pressure and cardiac output. As the body reaches its maximum ability to consume oxygen, there is a levelling off of the blood pressure and pulse rate with increased work load. The maximum oxygen consumption (VO_2 max.) is thus a reproducible measure of one's work capacity or state of physical fitness. The submaximal oxygen consumption for corresponding work loads is lower in more fit individuals because of a better mechanical work efficiency. Patients with coronary artery disease have an additional limitation to their exercise capacity in that the diseased coronary circulation cannot keep up with the increased myocardial oxygen demand during exercise. Such patients develop myocardial ischemia as evidenced by depression of the S-T segment of the electrocardiogram before their theoretical VO_2 max., and stop exercise due to angina, dyspnea, fatigue or arrhythmias.

The product of maximum heart rate and systolic blood pressure (double product) can be used as an index of myocardial oxygen demand or an indirect assessment of VO_2 max. Several studies now indicate that after physical training, coronary heart disease patients can exercise to the same submaximal work load with a slower heart rate, a decreased rate pressure product, and therefore a decrease in myocardial oxygen demand (Naughton, 1973; Segel, 1977;

Wilmore, 1977). For the cardiac patient this means he is able to do more work at a relatively lower heart rate before being limited by his coronary artery disease.

Summary of Chapter

As outlined in Chapter I, the purposes of this investigation were to develop and validate a scale for measuring sense of coherence, the central construct of the Salutogenic Model of Health. The components of the underlying conceptual model were discussed according to the elements constituting a theory, a set of interrelated concepts that are testable for the purpose of explaining and predicting phenomena. Operational definitions developed for this study were delineated. The following chapter contains a review of the pertinent literature pertaining to this investigation.

CHAPTER III

SELECTED LITERATURE REVIEW

The subject of the present investigation impinges on a broad range of theoretical and empirical references. To provide clarity in the review of the relevant literature, the investigator has divided this chapter into four subject area sections. The evolving conceptualization of health is presented in the first section. The second section is devoted to a review of the status of health indicators and the third section is a presentation of the evidence relating the concept of sense of coherence to health. The final section outlines principles of measurement theory deemed necessary before a measured construct can be considered to be accurately assessed.

Evolving Conceptualization of Health

Health has continually held high priority in the value structure of societies. The concept of health has a number of meanings depending on who is defining it, or on the purpose, time and circumstances governing its use. The versatility of the word has thus led to its vagueness and ambiguity. In this section, the investigator will present an historical and critical analysis of the concept health to attempt to uncover root concepts which can be equated with the meaning of health in the present period. The term health has come to refer to multiple concepts as opposed to a singular concept. Initial attention is therefore directed at clarifying the basic term prior to expanding on the operational model of health attempted in this study.

Various definitions of health will be examined from the view of how other disciplines and socioeconomic factors have influenced the evolving conceptualization of health.

Historical View

For centuries, the concept of disease has been the central focus in the examination of the phenomenon of health. During the Middle Ages, ignorance, coupled with fear, forced man to resort to superstitions to explain illness (Seguin, 1946; Wu, 1973). Illness was personified as an evil force attacking a passive, defenseless person. Due to the lack of scientific development, disease was recognized through intuition and considered punishment for committing sin. The word health first appeared around 1000 A.D.; it has an Anglo-Saxon origin denoting the state or condition of being sound or whole (Dolfman, 1973; Rogers, 1960). Health as soundness or wholeness of the body is implied throughout Shakespeare's writings. Physical wholeness was exemplified by Clara Wecks-Shaw in 1900 when she defined health as the "perfect circulation of pure blood in a sound organism (Wecks-Shaw, 1900, p. 13). A similar concept of wholeness appears in the New Testament and reflects a state of spiritual salvation or "sane happiness" (Blum, 1974, p. 76). Moral and mental soundness were emphasized by the religious institutions of the period and health became equated with prosperity or well-being. A present day custom of toasting to one's health represents this wish for an individual's well-being.

Transition from a religious or magical conception of illness to a scientific conception began with the Greek physician Hippocrates

(Mechanic, 1968). He believed each disease has a natural as opposed to a supernatural cause (Cockerham, 1978). Hippocrates believed that good health resulted from equilibrium within the body of the four humors and the harmony of the body itself with living habits and environment. He maintained that it was necessary to consider the "whole person" as the mind and body interacted (Cockerham, 1978; Wolinsky, 1980; Wu, 1973).

The Dark Ages marked the beginning of the mind-body dichotomy. The Church was given the responsibility for the study of the mind and the treatment of social problems (Cockerham, 1978; Temkin, 1953). The lack of understanding of social and psychological factors in illness continued during the seventeenth century. The French philosopher René Descartes reinforced the mind-body dichotomy by viewing the body as a physical machine capable of being studied, rather than viewing the person as a whole (Cockerham, 1978; Wolinsky, 1980).

The historical concept of health was therefore limited by the theological concept of sin. The significance of the historical period lay in health being defined as physical and spiritual wholeness with health being the absence of disease. This period also marked the contraction of the meaning of health from a generalized concept to a specific concept through the visualization of the body as a machine with a distinct separation from the mind.

Organic View

With William Harvey's discovery of blood circulation in 1628 and the spread of mechanistic thinking, the body was viewed as a system functioning according to mechanical and chemical laws (Temkin, 1958). During the first half of the twentieth century, the popular conception of health, closely related to the historical notion of body soundness, was that of health as a disease free state. Thus health and disease were considered polar opposites. The focus centered on the disease end of the dichotomy.

From the scientific conception of illness begun with Hippocrates, man began the search for causes of disease. Disease was conceived as an organic phenomenon. In the 1800's, Louis Pasteur and Robert Koch, in bacteriological research, conceptualized the germ theory of disease. The premise was that every disease has a specific pathogenic cause whose treatment was accomplished by removing the cause (Cockerham, 1978). Disease was a discrete "thing" inside the body, an entity of its own apart from the person who is the helpless victim.

Classical physicists, such as Newton, saw atoms as passive building blocks moved by some external force. From the second half of the seventeenth century to the end of the nineteenth century, the mechanistic Newtonian model of the universe led biologists to view the living organism as a machine constructed from separate parts and disease as a condition due to defective parts (Capra, 1980; Cockerham, 1978). Concern was with the "how" of disease ignoring the "why", as characterized in more current definitions by Blum, 1974; Dubos, 1965 and Parsons, 1951. The reductionistic phenomenon of contracting complex to simple relationships gave rise to the cellular concept of disease with science then focusing on organic disease and basic research for two decades following W.W.II. This period also witnessed the growth of specialization in medicine (Callahan, 1977; Cockerham, 1978). Not unlike the prescientific society, the medical model conceptualized health as the freedom from superimposed influences with the goal of health being "to minimize departures from physiological functions" (Blum, 1974, p. 78). With the medical model, health is the residual category of disease defined primarily in terms of physiological functioning.

Public Health View

From the medieval humoral theory and the Chinese doctrine of Yin and Yang, the physiological theory of disease developed. Disease was viewed as "an abnormal state characterized by the organism's failure to adapt to environmental challenges" (Hoke, 1968, p. 269). The late eighteenth and nineteenth centuries marked the link between health and lifestyle. The Industrial Revolution contributed to population shifts to urban areas, overcrowding, adverse working conditions, malnutrition, and poor hygiene. Improvements in sanitary living conditions were deemed paramount (Cockerham, 1978; Temkin, 1953). Great bacteriologic and immunologic discoveries of the late nineteenth and twentieth centuries led to the public health movement, and the concept of prevention of disease was added to cure. Epidemiological theories of disease arose and "health" was measured through mortality rates and life expectancy measures (Cockerham, 1978).

Subsequently, the ecological model of health developed which was based on the relationship of man to his total environment (Blum, 1974; Rogers, 1960; Wu, 1973). The intrinsic and extrinsic environment were considered as predispositions to the development of disease. Illness was seen as having multiple causes, not a single discrete agent. In viewing the interrelationships of things in the ecological approach, man was seen as actively altering his environment. Individuals were not seen as passive but active beings with differing abilities to resist illness. There was an observed relationship between aggressor, defenses and the degree of illness (Wu, 1973).

As the interactional process between man and his environment was seen to be in constant change, the equilibrium model was developed in which health was conceptualized as a balance between organisms and environment (Blum, 1974, Wu, 1973). This marked the end of viewing health as a static process; the focus was on the dynamic aspects of illness. Therefore, up to this point, conceptual polarities were dominating the conception of health: health-illness dualism, mind-body dualism and the reductionistic-holistic dichotomy. With health viewed as adaptation, a "super-biologic" outlook occurred with a search for ideal human functioning and control of diseases (Blum, 1974, p. 84). In conjunction with the environmental focus, health was looked at economically through cost-benefit techniques, which entailed the goal of expanding productivity by providing better education and improved resources for health protection (Blum, 1974, p. 82). To cite a more recent example of that interpretation, Klarman, in 1965, looked at health as a commodity to be purchased.

Psychosocial View

Knowledge of growth and development processes, of human needs, and the interrelationships between social factors and physical health have rapidly expanded in the past few decades. Due to rapid societal changes and the resulting pressures, psychosomatic diseases intensified (Lalonde, 1974, p. 25). The study of social-psychological factors and stress related diseases have advanced in the past years.

Emile Durkheim argued that a biological explanation of behavior was inadequate and that health must be explained through norms and values (Cockerham, 1978). Social epidemiology developed in the nineteenth century focusing on such factors as age, sex, race and social class as correlates of disease. Social stratification, ethnicity, and situational factors were now considered in the conceptualization of disease (Cockerham, 1978; Mechanic, 1968).

Psychiatry entered the picture about the turn of that century. In contrast to the mind-body dichotomy, Freud focused on the role psychological conflicts have in the origin of disease and suggested all dimensions of man must be considered (Cockerham, 1978). Therefore, the interaction of mind, body and society as a means of explaining stress related illness (Selye, 1956) developed and the conception of health was further expanded. Philosophically, health became the pursuit of self-realization and self-fulfillment as evidenced in the modern conception of health by Tillich (1967). Individualism became rampant with ideas of social justice and equality of opportunity emerging. In 1968, Ennes added self-responsibility to the conception of health. Postulations were formulated based on the humanitarian view of health about what man should or should not have to endure in life (Blum, 1974).

Positive Health View

In 1941, Sigerist argued that health is "not simply the absence of disease; it is something positive, a joyful attitude toward life, and a cheerful acceptance of the responsibility that life puts on the individual" (Sigerist, 1941, p. 100). The constitution of WHO, in 1958, stated that "health is a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity." Such definitions marked a positive conceptualization of health, looking at what health "is" and consists "of". However, these approaches have been criticized for their idealistic, utopian nature. Dubos insisted that health cannot be defined in the absolute because different people expect different things from life (Dubos, 1959). Various paradigms have been developed in attempts to answer what health is.

In the equilibrium model, health is viewed as the ability of the body's self-regulating powers to maintain constancy of the internal milieu. Health is conceptualized as a reaction of the whole organism, mind-body dualism no longer existing. Dubos described health as the condition enabling the individual to adapt to his environment, stating that "health and disease are the expressions of the success and failure experienced by the organism in its effort to respond adaptively to environmental changes" (Dubos, 1965, p. 17). Similarly, Wylie defined health as the "perfect, continuing adjustment of an organism to its environment" (Wylie, 1970, p. 103).

In sociological models, health is viewed as one's capacity to perform one's social roles and/or valued tasks relative to one's status in society (Parsons, 1951). Therefore health is viewed as a functional requisite of social systems and focuses on the consequences of the impaired condition to society. Health is conceptualized as a "social status, with the individual's capacity for task and role performance being optimized" (Twaddle, 1974, p. 33). Health is defined as a social value and is the central criterion employed in the evaluation of one group or person by another , hence labelling theory emerged (Cockerham, 1978). For example, the individual's rights and obligations may be altered if he is defined as sick. In the sociocultural models, only social functioning is taken into consideration with health being defined relative to the individual's social status in society (Wolinsky, 1980).

Another conceptualization of health is based on the individual's ability to perform and carry out his responsibilities in terms of his ability to function. In this case, evaluation and assessment of health depend upon the individual's capacity to fulfill his roles and tasks. Lifson defined health as "the degree to which a human's functions are performed and pain is absent (Lifson, 1969, List prepared for the California Center for Health Services Research). Similarly, Romano defined health as "the capacity of the organism to maintain a balance in which it may be reasonably free of undue pain, discomfort, disability or limitation of action including social capacity" (Romano, 1950, p. 410). Blum modified Romano's definition to state "health consists of: (1) the capacity of the organism to maintain a balance appropriate to its age and social needs in which it is reasonably free of gross dissatisfaction, discomfort, disease, or disability; and (2) to behave in ways which provide the survival of the species as well as the self-fulfillment or enjoyment of the individual" (Blum, 1974, p. 93). Engel integrates biological and psychological fields by stating that health is a "state of functioning effectively, fulfilling needs, successfully responding to the requirements and demands of the environment" (Engel, 1960, p. 459). In this way, disease is not distinct in itself but related to the individual and his environment.

Another paradigm of health is described in relation to the concept of normality. In the pathological sense, disease is present or absent. In the statistical sense, health is defined from its modal distribution in a population. In the social sense, health is referred to in reference to its culture, health as conformity, illness as deviance (Susser, 1974, p. 540). "Perfect" health becomes an ideal rather than a state expected to obtain. However, health has also become an instrumental value, an end to be pursued in itself (Morison, 1980, p. 62). Health can be valued to the detriment of or justification of other values and purposes where it becomes an end, not a means in itself. Frankl (1967) supports this notion by viewing health as self-defeating; the more one tries, the less one attains.

A further conceptualization emerging equates health with a positive lifestyle. Within this framework, attaining one's goals and ambitions in life is equated with quality of life. Health is the quality, resulting from the total functioning of the individual in his environment that allows him to achieve a personally satisfying and socially useful life. Authors such as Bauer (1955), Hoyman (1961) and Williams (1970) have concentrated their efforts in this area. McCall (1975) points out that the emphasis upon "quality of life" emerged due to society feeling that it is lost, despite its affluence. The desire to develop a measure of health analogous to the gross national product (G.N.P.) has been a venture associated with the attention to the lifestyle notion.

In 1959, Dunn introduced the concept of "high-level wellness": an integration of man's ability to function and adapt to his environment. Bruhn, Cordova, Williams and Fuentes (1977) identified tasks and behaviors that would promote high level wellness if completed by individuals at different developmental stages. They also suggest that good health is not static but a dynamic process which can evolve into wellness. The total individual and environment are integral to the dynamic state of wellness. In the psychological model, health is a general feeling of emotional well-being or "global" happiness.

Holistic View

With today's increasing health care costs, increasing chronic disease, increasing emphasis on self-care and the individual's responsibility for health, the promotion of health as a resource is becoming an intensified theme. With health conceptualized as a process, a developmental and behavioral response, not a static or homeostatic balance, cure and prevention of disease extend to the promotion of health. To overcome the limitations of the narrower conceptualizations of health, Lerner (1973) proposed that the components of health involve biological, social, moral and emotional aspects. In 1974, Becker proposed that persons will not seek health unless motivated and feeling vulnerable. Health therefore progressed to being conceptualized with a subjective aspect of feeling well and an objective aspect of the ability to function in all domains of life.

A multidimensional approach was advocated and a more generalized conception, "holistic" health emerged. In this view, the assumption is that each person is more than the sum of his or her body parts; further, to be healthy one must achieve a balance and integration of these parts for a total expression of well-being (Brallier, 1978; Masi, 1978). With the prevalance of chronic disease, the economic burden of health care and higher public expectations regarding cure, the medical model, based on a single cause-effect theory and reductionistic thinking, was not broad enough to explain promotive health behavior; it also failed to provide for the conceptualization of achieving higher levels of personal and sociocultural health (Capra, 1980).

The idea of holism began with the Gestalt theory which implies a state of feeling complete and balanced. To be healthy in a holistic sense is to achieve a balance and integration of the parts of one's self: mind, body, and spirit (Brallier, 1978). In terms of health, systems theorists (Churchman, 1968) view the individual as both a biological system and as a sub-component of larger family, social and ecological systems (Brody & Sobel, 1980). This framework allowed a dynamic, multiple causation, conceptualization and explanation of disease, an approach important from a political moral perspective because within this view the individual is viewed as a social, political and economic being and does not run the risk of becoming the "victim" of poor health (Crawford, 1977; Ryan, 1971).

Additionally, the traditional mechanistic view was replaced by one based on quantum mechanics, comprised of a complicated web of relations between various parts of a unified whole (Capra, 1980). The development of relativity theory, the unification of space and time and hence mass and energy, has forced modification of the conceptualization of health and reveals activity as the essence of being (Capra, 1980).

Health is viewed as each person being a unique combination and integration of physical, mental, emotional and spiritual aspects of "aliveness" (Brallier, 1978; Brody & Sobel, 1980; Capra, 1980; Masi, 1980; Winstead-Fry, 1980). The origins of disease begin in man's basic spiritual values and attitudes towards life which are manifested in lifestyle, habits and conscious awareness, and are further manifested in man's body energies and physical self as a projection from a hologram (Svihus, 1980). Within this perspective, health is viewed as a product of man's total way of living.

High level wellness, although often equated with holistic health, does not necessarily imply the same thing. Holistic health is an approach to treating illness, emphasizing self-responsibility, the whole person and the process of care giving as opposed to the product (Ardell, 1979). Wellness is concerned with the promotion of health by reducing the risk of illness, and increasing life satisfaction and serenity. Health, also dynamic, is but a result of a "wellness lifestyle" (Bruhn et al., 1977; Egbert, 1980).

In sum, the concept of health has undergone many transformations. During Greek and Roman times, health was a unitary concept that implied a positive relationship between body and mind. With the advent of modern science, single agent theories emerged in an attempt to explain complexities of man. Health was considered simply the absence of illness. In the mid-twentieth century, the unitary view of optimal health reappeared; a view which presumes the interrelationship between mind, body, human behavior and the environment.

Status of Health Indicators

Criteria for evaluation of health indicators have been considered by Goldsmith (1972) and Sullivan (1966). Sullivan suggests that health status indicators should reflect changes in health states over time and be subject to sub-component analysis. Goldsmith outlines seven criteria: (1) the purpose of the indicator should be stated, (2) the numerator and denominator used to compute the index should be readily understood, (3) data used must be available, (4) the process of computing the data must be readily understood, (5) components of the index must be clearly identifiable and effects on the total index distinguishable, (6) data must be reliable and valid, and (7) there must be a built-in mechanism to evaluate the validity of the measure by correlating health status with social well-being (Goldsmith, 1972, p. 216). A few of the more well known health status indexes are reviewed below.

Objectives of Health Status Indexes

A problematic but essential step in developing an index of health is that of clarifying the purpose(s) of health status indicators. An indicator is a means, not an end in itself, and before its usefulness can be established and ascertained, its purpose must be recognized (Hockey, 1977). A first objective suggested by Bickner (1970) is that of providing public information. In the form of a "consumer price index of health", information would be utilized to inform the public and formulate legislation on the health situation. As a weapon for social reform, a health index would draw more attention to health and suggest priorities in the allocation of funds for health needs. How valid a consumer price index of health would be is a most interesting question. It would be an important tool for setting macro-level priorities; however, a macro-level tool would have limitations for micro-level decision making (Goldsmith, 1973).

A second objective is to evaluate the effectiveness of health programs (Lerner, 1973). Health indexes could help administrators in decision making regarding planning and evaluation of health services. A third objective is to evaluate the quality of services provided by health professionals. Health indicators would assist in performing descriptive and experimental research (Goldsmith, 1972). A fourth objective outlined by Lerner is to scientifically discover the "true nature of society, independent of any practical application" (Lerner, 1973, p. 7). Health involves a social human being functioning in a social environment with social roles. However, that raises the question, what is social well-being? In addition, health of the community is perhaps more than an aggregate of the health status of the individuals comprising it. Well-being of the individuals is associated with the health of the community through health services offered, environmental conditions, employment, educational and recreational activities (Lerner, 1973). Is the emphasis on individual or community health and what effect does each have on the other?

Problems in Operationally Defining Health

Inherent in these objectives are the problems of defining health in operational terms. Some indexes are based on conceptions of health broad enough to include physical, emotional, cultural and social components; in these indexes, health is equated with quality of life. In the other extreme, some indexes are narrowly focused on criteria of physical illness. Indexes based only on broad theoretical health frameworks have the virtue of including a wide range of information but the limitation of containing little reference to specifics. Narrower indexes entail fewer operational problems but are too specific for testing hypotheses rooted in broad social theory.

Lerner (1973) proposed taking the WHO definition of health (1958) further to include moral, emotional, cultural and social components of the quality of life. The World Health Organization has been working on health indicators since its inception. Two approaches to the problem have been to define health indicators in relation to social conditions (WHO, 1957) and secondly, to define health indicators in relation to individuals' level of health, to factors influencing health and to evaluation of health services (WHO, 1971). Sanders (1964) recommended utilizing functional adequacy as an indicator of health status, while Sullivan (1966) further suggested clinical evidence, subjective evidence and behavioral evidence as measures which reflect health levels in terms of a life free from disability.

Conceptual clarification of health has been hampered by the term being value laden, abstract, subjective, cultural and dynamic. The central problems with current definitions of health are ambiguity and abstruseness. How does one translate into operational language concepts such as "well being" or "life satisfaction"? Failure to account for the concrete frames of reference within which health is to be measured may account for the variety of meanings assigned to health and the difficulty in operationalizing the term (Goldsmith, 1972; Sullivan, 1966). Within this "bottomless conceptual pit", health becomes undistinguishable in terms of its political, ethical or cultural roots.

The issue of whether health indicators should measure positive as well as negative health is inextricably rooted in the problem of an adequate conceptualization of health. Factors which prevent disease are not necessarily those that promote health. Health has been conceptualized as a unidimensional versus multidimensional phenomenon, as a polar opposite of disease, on a continuum with disease varying only in quantity, and as a separate entity from disease with the health state reflecting a net balance between the two (Wu, 1973). Lack of an adequate conceptual basis for measuring positive health has caused investigators to apply indicators that are distributed toward the low end of the continuum and discriminate only among levels of poor health (Bice, 1976). Perhaps a phenomenological approach would be a more suitable type of methodology required in measurement of positive health, in order to account for promotive health behaviors and healthy living.

Traditionally, mortality indicators have been utilized as measures of health. Numerous criticisms have been raised regarding these indicators, one of which is the low sensitivity to the wellness-illness continuum (Balinsky & Berger, 1975; Goldsmith, 1972; Lerner, 1973; Sullivan, 1966). Mortality-based indexes usually offer data on age/sex adjusted life expectancies. Moriyama (1968) analyzed mortality rates and found the assumption of a relationship to health to be tenuous. Moriyama's conclusions further emphasized the downward shift of mortality rates and the need for greater emphasis on the effects of chronic disease on the quality of health.

As chronic illness, both physical and emotional, became a labelled entity, morbidity indexes were developed. Some of the characteristics used were disability, dysfunction, activity, utility and discomfort. Instruments such as the Cornell Medical Index (1949) and the Kisch, Kovner, Harris and Kline (1969) proxy measure reflect client self-reports of signs and symptoms to measure the presence of disease. Although morbidity is a more sensitive measure of health than is mortality, the problems of defining variables and measurement techniques are considerable (Balinsky & Berger, 1975). To the extent that morbidity is viewed as encompassing social conditions, attempts to measure states of well-being are encumbered with problems.

Morbidity and mortality definitions alone often indicate the negative side of health only (Kaplan, Bush & Berry, 1979; Sullivan, 1966). A design for unifying morbidity and mortality data into a single index was next proposed by Chiang (1965). In this mathematical model, the frequency of illness, the duration of illness and mortality are aggregated. This conceptualization of health accounts for quantity of life treating all states of ill health equally, with no reference to quality of life. Sullivan (1971) developed activity levels in his disability component study by combining mortality and morbidity data to develop a general index sensitive to changes in health status over time. A major limitation of Sullivan's index is that of only providing gross health levels, hence lacking sensitivity. Another attempt to combine mortality and morbidity data is the Miller's Indian Health Service Q Index (1970).

Morbidity is assessed through activity counts from hospital days, disease days, and outpatient visits. However, no satisfactory operational definition for morbidity or disability was developed.

Torrance (1976) defined health as consisting of physical, social and emotional components. This model does not consider activity levels or disease disabilities, but uses an individual rating for the quality of health. These values are culturally bound and the assumption of "normal" is biased by each individual's perception. Backett (1963), Lalonde (1974) and WHO (1971) looked at health status, health services, environment, lifestyle and risk states as components in measuring health.

More specialized health indicators emerged, with the focus on psychosocial well-being. Examples are the Social Readjustment Scale (Holmes & Rahe, 1967), the Sickness Impact Profile (Bergner, Bobbit, Pollard, Martin & Gilson, 1976), Health Locus of Control (Wallston, Kaplan & Maides, 1976), Psychosocial Adjustment to Illness Scale (Morrow, Chiarello & Derogatis, 1978) and Measurement of Psychological Well-Being (Bradburn, 1977), to mention only a few. Each of these indexes is less than comprehensive at best, and none is rooted in a holistic conceptualization of health.

Therefore, operational problems emerge from specific versus global definitions, objective states versus subjective perceptions, micro versus macro analytic approaches and cultural relativism (Kennedy, Northcott & Kinzel, 1978). According to Sackett, Chambers, MacPherson, Psych, Goldsmith and McCauley, 1977, prerequisites for health indicators should therefore be: (1) comprehensive to include physical, social, emotional and cultural aspects, (2) positive in orientation,

(3) applicable to population, (4) sensitive to detect changes in status, (5) precise, and (6) amenable to a composite health index construction (Sackett et al., 1977, p. 423).

Methodological Problems in the Measurement of Health

Measurement of health requires selection from many characteristics of a person or population. An individual classified as healthy by one set of criteria may be labelled unhealthy by another. A frame of reference for health classification should involve "the purpose, rules for selecting and classifying observations and the assumptions that certain observations can be made" (Sullivan, 1966, p. 5). These set limits on what is possible to observe and measure. The conceptual issues surrounding the multidimensional, qualitative aspects of health lead to several measurement problems. A single indicator of health consistently underestimates the differences between groups because of the multiple dimensions of health. A health index that combines multiple indicators according to predetermined weights would seem to be needed.

Joint mortality/morbidity indexes utilize the disability definitions of morbidity mathematically weighted and combined with mortality data. However, such an approach brings problems of measurement into the foreground. What weights should be assigned to health states? What is the probability of moving from one health state to another? How can the future risks to an individual be incorporated into his current health status?

It is simplistic to assume that all indicators of health are equal, yet assigning weights to the health indicators is methodologically problematic. The literature would indicate that individuals subjectively attribute different weights to points along the health continuum at different stages in their lives (Lerner, 1973). The health continuum cannot be quantified like a temperature scale. The continuum could be divided into sets of ordered health states with the levels of health being the weights of health states plus the expected time span of each state. For example, methods summarized by Balinsky and Berger (1975) for weighting health states are: paired comparison techniques, scaling models, equal appearing intervals using a modified Delphi technique and assignment of economic values, but each has its limitations.

Sanders (1964) focused on productive man years and biological adequacy in determining health states. However, no measurement of "functional adequacy" was explained. In contrast, Fanshel and Bush (1970) proposed a health index based on a function-dysfunction continuum. Paired comparison techniques were utilized to calculate social weights. However, no agreement on the classification of health states or a method of rating individuals on the proposed scale is included in this index. In 1972, Breslow collected subjectively defined data on health in the physical, mental and social sense and assigned scores to these ratings. These approaches to devising a single index of the state of health lack an agreed upon unit of measurement and system of weighting factors to be applied in combining the various states of health. In these regards, it is interesting to note that Patrick, Bush and Chen (1973) attempted to expand the definition of "function states" to include physical activity, mobility and social activity. They employed an interval scale with the objective of constructing individually weighted health states.

At the methodological level many questions concerning how the value system of a health index should be measured remain. Is the health index different for different socioeconomic groups in society? Is the value system different for well people and people with disabilities? If a difference does exist, the question of whose value system should be used is raised. Is every person equivalent regardless of age, sex, color, education and employment? Additionally, the utility of a health index may be a function of time (Torrance, 1973). What is the probability of moving from one health state to another? In 1973, Chiang and Cohen combined the proportion of people categorized in a number of health states, determining the probability of movement from one state to another and assigned a set of weights to each health state. No agreement, however, was reached on the number of health states required to assess a total population or the weights to be assigned to each state. A further problem is whether probabilities are incorporated into value judgements.

Means of incorporating future risks and promotive health behavior are not clearly delineated in the literature. The Northeast Ohio Regional Medical Program (1968) utilized a high risk profile concept. A combination of genetic and socioeconomic factors were conceptualized but were not assigned any values or weights. The perplexing problem of relating current health status to future health status remains a substantive issue.

Health status requires measurement not only at the global "general satisfaction level" but also at specific levels of analysis. How should the micro and macro units of analysis be combined? Given the broad subjective and objective aspects of health, further concerns arise. For example, do objective states of health vary greatly from subjective perceptions of health states? Garrity, Somes and Marx (1978) in their study on factors influencing self-assessment propose that people's perceptions of their own health status can be a valid measure of clinically measured health status.

The measurement of health also involves the issue of whether the concept should be viewed as a dependent or independent variable. As a dependent variable, health is referred to as the presumed effect. As an independent variable, health is a presumed "cause" of other behavior, for example, lifestyle. The key point appears to be that health status indexes will be used for different purposes and should therefore be tailored to those purposes. Probably no single index of health will be applicable at all times and places or for all populations or segments of the same population (Lerner, 1973).

Since a primary purpose of health indexes is comparison over time, evaluation of reliability should take into consideration both the factors influencing measurement under current circumstances and the possibility of measurement over time being distorted by social change. The health status index developmental work has not widely dealt with validation procedures. If health is relative, what can it be measured against? Since the validity of health measures are difficult to test by direct comparison with a criterion measure, "it must be established by showing that a variable measured has a necessary position in a theoretical scheme from which empirically verifiable predictors can be made," that is, construct validity is essential (Sullivan, 1966, p. 15). Before being accepted for general use, consistently high correlations between indicators should be determined (Goldsmith, 1972).

Sackett et al. (1977) have suggested that establishing face, biologic and clinical validity are necessary steps in validating health indexes. Some other investigators are approaching validation procedures through utilizing a variety of measures of content, construct and criterion validity. Factor analysis, physician estimates of health as criterion measures, correlating a variety of phenomena for convergent construct validity, and stepwise multiple regression to ascertain discriminant validity have been attempted by researchers such as Berg (1973), Carter (1976), Johnston and Ware (1976), Kaplan et al. (1976) and Ware (1976).

Currently five major features of health can be identified in the literature. They are freedom from symptoms, physical health, mental and emotional health, well-being and functional capacity. Each feature is viewed as qualitatively distinct and made up of qualitatively differing facets. These features and their facets possibly do not have common denominators; therefore the difficulty in adding or otherwise combining them into a single health index has been discussed. In the quest for the single, global index of health status and the ultimate definition of health, conceptual and methodological problems have arisen which have tended to obscure rather than inform. Perhaps more creative application of statistical techniques can help to clarify whether variables are indicators of a general concept of health or are causally related, but conceptually distinct phenomena (Bice, 1976).

Critical issues in developing an instrument to measure health therefore appear to be those of: (1) definition - conceptual criteria for assessing health, (2) measurement - a unit of measurement and system of weighting factors, (3) reliability and validity testing, and (4) sensitivity and applicability of measurement (Balinsky & Berger, 1975, p. 284). Patrick (1976) suggests efforts should be directed towards constructing social metrics for health that are prospective, content, independent, relevant, community wide, ratio scaled, sensitive, validated and applicable to normative social theory building. These may help answer the question, who prefers which states of health under what circumstances? The inductive approach from description and measurement to theory building, would seem to be a prime feature of the state of the art at present.

Evidence Relating Sense of Coherence to Health

What distinguishes the people who stay healthy? Investigators are only starting to learn how various kinds of behavior are related to one's health status. Evidence found in the literature supporting a relationship between various factors and general health status will first be reviewed. Following this, the specific evidence related to coronary heart disease will be discussed. (The specific link to coronary heart disease is due solely to the interest of the investigator and not to suggest a unique realtionship.)

General Relationship Theories

Researchers are now beginning to emphasize that large numbers of people are not falling mentally or physically ill under very adverse circumstances. Pines (1980), in a review of three major investigators, supports this position by discussing the role of challenge in the health of stress-resistant people. Kobasa and Maddi (1979) describe characteristics of what they term "hardiness". They have found that the attitude of an openness to change, a feeling of involvement in whatever they are doing and a sense of control over events had a profound effect on health among hundreds of business executives, lawyers, army officers and retired people. Similar evidence was found in studies relating quality of life to health. For example, Frankenhauser (1977) purports that a lifestyle with a moderate, varied flow of stimuli and events, opportunities to engage in meaningful activities and to exercise personal control over external conditions are key criteria for behavioral adjustment.

In support of a link between sense of coherence and health status, a study conducted by Antonovsky and Shoham (1978) suggests that coping ability correlated (0.49) with the measure of health. No other measure in the study had such a high correlation with health except for a life satisfaction index. More indirect evidence suggested by Antonovsky, is that a "central characteristic of lower social class life is a weak sense of coherence" (Antonovsky, 1979, p. 164). One factor which may account for this is the lack of social contacts. A strong sense of coherence, on the one hand, is fostered by social supports and, on the other hand, enables one to mobilize emotional support in coping with stressors. Porritt (1979) similarly suggests that the outcome of a crisis most probably depends on the interaction between coping behavior of the individual and the support elicited from the individual's social network. Additionally, when an individual "exists in a cultural situation that places demands upon him that are excessive in terms of his ability to meet them, ill health appears" (Antonovsky, 1979, p. 170).

Meux (1980) conceptualizes sense of coherence as a coping strategy for value conflict. Resolving interpersonal value conflicts is viewed as "healthy" in that increased self-confidence and a sense of rational control over the environment would result. An overall plan of action for overcoming stressors is seen as having characteristics of rationality, flexibility and farsightedness. The basic assumption is that "a participant's sense of coherence can be improved by improving the actual coherence of formulations of various aspects of content in the self as object," which is beneficial in combating stress and promoting health (Meux, 1980, p. 67). Findings from a broad range of studies have demonstrated that a greater adaptive functioning is found in those persons holding internal as opposed to external expectancies (Rotter, 1966; Strickland, 1978; Wallston & Wallston, 1976).

Holmes and Rahe (1967) postulate that life change events are decisive determinants in health and illness. Similarly, Toffler (1970) believes that change itself, not this or that specific change but the general rate of change in a person's life, could be one of the most important environmental factors of all. Antonovsky (1979) hypothesizes that a relationship between life events and a sense of coherence exists. The person with a "high sense of coherence mobilizes resources to adapt to demands of life changes whether positive or negative" (Antonovsky, 1979, p. 177). It is a parsimonious way of looking at a great variety of variables, going beyond Selye (1956), to account for the relationship between stress and dis-ease. Kelman (1980) further expands the notion of dis-ease being a result of societal stress of a modern capatalistic society. The necessary link to health is proposed to lie in the social organization where a "system of production is subordinate to a predetermined pattern of social development emancipated from accumulation" (Kelman, 1980, p. 141).

The approach herein was an attempt to discover some understanding of the complex relationship between health and attitudes. Youmans (1974) in a study on health and attitudes in different age groups was perplexed by finding very little support for the relationship between attitudes and health but explained this partly in terms of the character of attitude scales. However, Thornstom (1975) continued that study to conclude that attitudes, objective health status and subjective health status are interacting health variables. More specifically, these interactions will be discussed in relation to the individual with coronary heart disease.

Coronary Prone Personality

Central to this investigation are the considerations about health and illness as they relate to coronary heart disease. In the pre-illness phase, there are important leads as to predisposing physiologic factors. However, the interrelationships of these physiological risk factors are not clear. Precise identification of psychological factors which are thought to play a role in the onset of coronary heart disease have not been studied in depth. It has yet to be determined which combinations of these variables predispose to illness. Is there a relationship between life stress and physiological dysfunction? The Type A behavior pattern popularized by Friedman and Rosenman (1974) is highly suggestive of a weak sense of coherence. They reported on an eight year study which showed that men with a Type A pattern were twice as likely as Type B's to develop coronary artery disease (Rosenman, Brand, Tenkins, Friedman, Straus & Wurm, 1975). A recent review by Zyzanski (1978) summarizes the evidence for a positive association between Type A behavior pattern and coronary heart disease as documented by retrospective and prospective epidemiological data and angiographic validation.

Type A looks very much like that of persons who are in high need for power, whose power motivation is inhibited and who are also under power stress. The Type A behavior pattern is defined as a constellation of psychological and behavioral characteristics, including such features as enhanced aggressiveness, hard driving competitiveness and a chronic sense of time urgency (Dembroski, 1978). There is a constant struggle to obtain unlimited things in the shortest possible time against opposing efforts of other people in the environment. Type A may be interpreted as a response style for coping with threats to a sense of mastery and control. Impending lack of control is anxiety arousing. There is an orientation that no matter how hard one tries, one will never succeed in being under control (Antonovsky, 1979, p. 175). This consistent experience with uncontrollable stress leads to feelings of helplessness (a weak sense of coherence) among Type A's. Schlegel, Wellwood, Copps, Gruchow and Sharratt (1979) reported a negative correlation between perceived challenge and symptom reporting for Type A's. Type A's who perceived themselves as highly challenged did not report (attend to symptoms) as those Type A's who feel less challenged in their daily living.

Friedman and Rosenman have also conducted studies suggesting that Type A behavior may elevate plasma cholesterol (Friedman & Rosenman, 1958), triglycerides (Friedman, Rosenman & Byers, 1964), noripinephrine (Friedman, Byers, Diamant & Rosenman), corticatropin (Friedman, Byers & Rosenman, 1972), insulinogenic response to glucose (Friedman, Byers, Rosenman & Elevitch, 1970), enhance the clotting of blood (Friedman, Rosenman & Carroll, 1958), and the sludging of erythrocytes (Friedman et al., 1964). While the cause-effect relationship between Type A behavior and coronary artery disease is still controversial, some major effects of Type A stress are definitely known. Stress causes an increase in blood pressure due to sympathetic nervous response. If stress is constant, small tears along the walls of arteries become apparent and the heart hypertrophies (O'Flynn-Comiskey, 1979). Cholesterol levels have also been shown to vary proportionately to the amount of stress (A.H.A., 1973). With stress, norepinephrine and epinephrine are released, accelerating blood clotting time. Johansson, Jonsson, Lannek, Blomgren, Lindberg and Poupa (1974) found major electrocardiographic changes evidenced by T-wave inversions, arrhythmias and elevation of the ST segment in stress induced subjects.

The incidence of coronary heart disease is significantly greater in Type A than Type B subjects; further, other risk factors which are associated with coronary heart disease are found in increased incidence in Type A's. In this investigation, the greater the number of connections made between sense of coherence and psychosocial variables on the one hand and physiological variables on the other, the greater the possibility for generating a variety of explanations of the role of a sense of coherence in the health of coronary patients.

Response to a Myocardial Infarction

Traditionally, the functioning of the heart has been equated with life itself. In the initial period after a myocardial infarction, the patient's primary reaction is one of anxiety. Consequently, at that point in time, a myocardial infarction may be conceptualized as a stressor as opposed to a result of stress. Articles documenting the conflicts experienced by patients in both the acute and convalescent phase are numerous. Throughout the convalescent course, wide variations in dis-ease have been revealed. A survey of the literature on cardiac rehabilitation indicates there is a wealth of information describing the behavioral responses and problems facing the post-myocardial infarction patient (Cook, 1979; Croog, 1978; Finlayson & McEwen, 1977; Hackett & Cassem, 1978; Monterio, 1979; Scalzi, 1973).

Strain outlines seven stressors to which the cardiac patient is vulnerable. These include a threat to integrity, fear of strangers, separation anxiety, fear of loss of love and approval, fear of loss of control, fear of loss or injury to body parts, feelings of guilt and shame along with fears of retaliation for previous transgressions (Strain, 1979, p. 18). Because coronary heart disease has a rapid onset, the patient is overwhelmed, confused and panic-stricken ("shattering" of the sense of coherence). Inhibitions and phobias surrounding work, family, activity and sex arise. Depression, anxiety, anger, fear or regression result. The heart attack patient's chief problem may be one of "minimizing losses", which requires a decision to make certain "cutbacks" in everyday living (Mullen, 1978, p. 299). This necessitates decision making to renormalize one's life in a state of relative ambiguity, autonomy and anxiety (a loss of coherence). Mullen (1978) in a grounded theory approach identified that resolution is achieved through explaining and estimating the damage (comprehensibility?), figuring a personal calculus to what must be cutback (manageability?) and adjusting to new changes which affect identity (meaningfulness?). Life is reorganized to minimize losses, manage risks and estimate the effects of cutbacks.

Articles on psychological response to a heart attack are numerous. Slay states that patients suffer only a "myocardial infarction but an ego infarction" (Slay, 1979, p. 336). By the third day post-infarction, depression together with helplessness and hopelessness, sets in (Cassem & Hackett, 1973; Foster & Andreoli, 1970; Slay, 1976). A study done by Wishnie, Hackett and Cassem (1971) reports that after six months at home, 88% of the 50 randomly selected coronary patients were depressed, 55% had sleep disturbances, 38% had failed to return to work for psychological reasons, and 83% complained of weakness. Some patients display hostility and agression; some display denial. A heart attack is a real crisis and promotes fear and anxiety with threats to life and ego identity (Brammell & Niccoli, 1976; Comoss, Burke & Swails, 1979). The crisis may therefore threaten a patient's integrity and sense of worth and adequacy to others; and further, emotional distress may be a major barrier to rehabilitation, with wide variations in dis-ease being reported through convalescence (Speegle, Bayer & Greene, 1979). Often forced to assume a passive role due to physical limitations following a heart attack, the patient may be made even more anxious and helpless, handicapping his usual adjustment mechanisms for an altered status. Brammell and Niccoli (1976) indicate all aspects of the patient's life are threatened: his pleasures, job, role, income, self-esteem, health and relationships.

In a study by Mayou, Williamson and Foster (1978), 100 patients were interviewed two months after a myocardial infarction. At two months, 65% reported physical symptoms (pain) occurring occassionally or to a moderate degree, 23% described mild mental distress and 30% moderate or severe symptoms (fatigue, irritability), 47% were satisfied with their progress and 28% were dissatisfied and frustrated, 90% were less active than before, 60% had no plans for changes in their lives and 67% thought reducing stress was unnecessary or beyond their control. Therefore, there is substantial disability having widespread effects on all aspects of the lives of patients. In a one-year follow-up, the investigators found that while outcome was considered "satisfactory," there was still significant psychosocial morbidity. Dimensions of illness behavior were also examined by Byrne and Whyte (1978) in 120 myocardial infarction patients. Principal component analysis with varimax rotation yielded eight meaningful factors. These were interpreted as somatic concern, feelings about psychosocial precipitants to illness, affective disruption, affective inhibition, illness recognition, subjective tension, sick role acceptance and trust in the doctor.

From this evidence, one may state that perhaps the cardiac patient is felt to be adjusting as opposed to adapting. The crisis of infarction seemed to prove the opportunity and stimulus for greater understanding and occassionally for constructive rethinking and planning (Mayou et al., 1978; Mullen, 1978). However, maladaption does occur. One type of maladaptive behavior is the development of a self-destructive pattern (Gentry & Williams, 1979). Logic and reality are dismissed, evidenced by a denial of reality, created by patients continuing to smoke, overindulge in physical activity, work and sex. The "supermale" disregards symptoms and medical suggestions. On the other extreme, the "cardiac invalid" becomes excessively helpless and dependent. Such a patient overrestricts activities and "his heart becomes the principle basis of his relationships" in attempts to achieve desired goals (Gentry & Williams, 1979, p. 115).

Illness constitutes a frustration in role expectations and exit from the sick role requires a role transition. Monteiro (1979) verifies this by pointing out that to relinquish the sick role one must have not only the physical capacity, but must reverse his way of thinking from sick to well. Disability perhaps can only be understood in the context of pre-morbid adjustment and the personal life events occurring post-infarction. "Living is activity" (Cassem & Hackett, 1973, p. 287) and therefore, what better way is there to affirm life than focusing on "doing" or activity? Although the evidence is not scientific, Anderson (1977) noted that an activity program begun during the third to sixth week of illness often determines the future health of the individual. In contrast, Garrity (1973) found that a high level of activity and social involvement after heart attacks was not a predictor of good morale. Instead, the patient's perception of his health proved to be the strongest predictor. Garrity (1973) in another study identified that the patient's perception of health status, social class and sense of control over his fate were significant predictors of vocational adjustment after a first myocardial infarction.

There are significant associations between coping behavior of the patient, encouraging attitudes of relatives and a satisfactory outcome. In Monteiro's study (1979), the expectations of "significant others" had a significant effect on the return to work of cardiac patients.

In view of the sizeable literature on psychological responses to heart attacks, it is remarkable how little controlled research exists on the determinants of post-attack psychological status. In the literature, factors felt to be predictive of psychological responses were age, Type A personality, social class, prior personality status, severity of illness, relationship with family, meaning of illness to patient, financial concerns, or locus of control (Bruhn, 1973; Croog, 1978; Friedman & Hellerstein, 1973). Other questions which do not seem to be addressed include: What factors affect the variation in response to a heart attack, the differing degrees of dis-ease? Are there differing characteristics among individuals expressing more or less dis-ease? What factors can contribute to successful rehabilitation, and hence health? What independent variables provide life experiences related to increasing the sense of coherence? Is "caring" by both health professionals and patients a central activity of promoting health?

The assumption that the premorbid level of sense of coherence may be related to the health status of the patient which in turn may account for the adaptation post-infarction is indirectly stated in the literature. Additionally, the life events surrounding the stressor of a myocardial infarction may influence the post-infarction level of sense of coherence, both positively or negatively. Cardiac patients with a strong sense of coherence may adapt to change better than cardiac patients with a low sense of coherence. In this study, a myocardial infarction is viewed as a stressor causing a disruption in a sense of coherence. To adapt, one restores consistency, meaning and control to life. Do the consequences of a myocardial infarction involve major long-term adjustments which disturb the existing assumptions and patterns of living for patients and families? Does this point to the limitations of the disease model and suggest the need for developing a combined physical, social, psychological perspective on the process? The Salutogenic Model of Health (Antonovsky, 1979) was employed by the investigator in attempts to combine and clarify the multifactors related to "health effects" of a myocardial infarction.

Effects of Rehabilitation Programs

The specific rehabilitation program in the investigation proposed here is a physical activity program. Benefits of exercise programs on "health" have been widely documented (Vezina & Ruegger, 1980). The greatest abundance of literature is on quantitative measurement of the physical benefits of physical activity. Acute and chronic physiological responses (Wilmore, 1977), effects on myocardial, skeletal, biochemical, circulation and hemostatic mechanisms

(Fletcher et al., 1979; Haskell, 1977; Lee, Amsterdam, DeMaria, Davis & LaFave, 1977; Segel, 1977) and modification of coronary risk factors (Bonanno, 1977) have been extensively documented in research studies. The qualitative benefits of exercise programs, however, are not as well documented in the literature.

There is growing evidence that planned activity programs for post-infarction patients are playing a useful role. Improving "quality of life" and combating depression are frequently cited outcomes (Hackett & Cassem, 1978; Heinzelmann, 1973; Shephard & Kavanagh, 1978). Heinzelmann and Bagley (1970) found that 60% of the 108 participants had improved work performance, 40% had a more positive attitude towards work, manifested a more positive self-image, and possessed a greater ability to cope with stress and tension. In a replication study, they found a positive relationship between the personal health effects reported and physiological functioning based on treadmill performance. Regular exercise has also been associated with improved sleep, better eating habits and digestion, and improved use of leisure time activities (Cassem & Hackett, 1973). A higher frequency of return to jobs than for patients not performing exercise has also been demonstrated (Heinzelmann & Bagley, 1970). Studies have reported favorable changes in perceived health and improved sexual adjustment. They conclude that exercise prepares one to withstand the stresses of illness better (Folkins & Amsterdam, 1977).

Multiphasic personality inventory tests given to patients during exercise programs show a decrease in scores related to depression, an increase in extroversion and an increase in the sense of well-being (Berra, Fair & Houston, 1977). Heller (1972) also confirms decreased anxiety, return of self-confidence, feelings of being more relaxed and more willing to accept other therapeutic restraints such as diet or smoking. Longitudinal studies are necessary to confirm or reject the hypothesis that "personality" improves with fitness. Ismail and Young (1977), using the Cattell 16 Personality Factor Questionnaire, found the most pronounced personality differences were those related to stability and security in high fitness groups. However, a few months of activity is insufficient to bring about significant personality changes. Sharkey (1979) found the most notable change was in body image with the new confidence influencing personality traits, stress and anxiety reduction, and having a tranquilizing effect on other aspects of self-concept. Blumenthal, Williams and Wallace (1980) found a reduction in the magnitude of the Type A behavior pattern through exercise in a group of healthy middle-aged men. However, in the absence of a control group, it was impossiable to specify the mechanism by which the Type A scores were modified. Many researchers consider personality structure, needs, affects and drives, and in particular, the level of anxiety, as the most crucial factors in successful rehabilitation. In the International Survey of 1970 (Fischer, 1973), 30% of the cardiologists surveyed reported fear of recurrent-heart illness was the major barrier preventing return to work, 17% reported anxiety, depression and guilt, 10% noted fear of insufficient working capacity, and 8% noted fear of sudden death as the major barrier.

Psychosocial effects of activity programs for the post-infarction patient have been studied using a range of variables, including depression, anxiety, fear and introversion, as measured by such models as multiphasic personality inventory tests on patients participating in exercise training programs as reflected in the research by Heller (1972) and Shephard and Kavanagh (1978). Other investigators have measured the outcomes of activity programs through evaluating stress levels, tolerance to stress and tension management (Folkins & Amsterdam, 1977). Program effects have also been described in terms of subsequent work performance, involving such aspects as rate of return to work, work performance, and attitudes towards work (Garrity, 1973; Heinzelmann & Bagley, 1970).

Many studies report patients' changes in lifestyle habits in the areas of diet, sleep, rest, leisure time activities, and smoking and drinking habits (Cassem & Hackett, 1973; Heinzelmann & Bagley, 1970). Another focus has been that of "general well-being". Energy and stamina, patients' perceptions of their health, weight reduction, social involvement and family relationships have been used as variables in the measurement of well-being (Berra et al., 1977; Garrity, 1973). Exercise has also been shown to influence an individual's self-concept, feelings of self-sufficiency and accomplishment, emotional stability, and the sense of control over life events as measured by such scales as the Health Locus of Control or the Social Readjustment Rating Scale (Berra et al., 1977; Hackett & Cassem, 1978; Folkins & Amsterdam, 1977; Niccolli & Brammell, 1976).

A relatively unique restoration program for cardiac patients is surgery. Despite its increasingly widespread use to combat symptoms, coronary artery bypass surgery and its outcomes are only beginning to be studied. Quality of life for post coronary artery bypass patients has been studied through measures of social situation, physical limits, work status and exercise tolerance (De Caprio, Rengo, Spaminato, Scarafile, Chiariello, Meccariello & Romano, 1980; La Mendola & Pellegrin, 1979). Generally, the literature reflects coronary artery bypass surgery as being seen as a positive factor in improving the physical and social situation of the patient. But this investigator viewed the surgical experience as a potential stressor causing downward movement on the sense of coherence continuum. Additionally, however, as an SRR, surgery could potentially be a positive factor in the health outcome of patients.

Focus of Conceptual Relationships Identified for the Study

With the abundance of approaches reviewed in evaluating psychological and sociological factors in response to rehabilitation programs, the theoretical and methodological difficulties are apparent. Most of the research strategies entail descriptive studies with a limited focus of one or two variables. Omission of relevant control variables makes it difficult to assess the importance of assorted factors suggested in the literature. Few investigators have explicated a conceptual framework in measuring concepts such as "well-being" or "quality of life". What is the concept being addressed? What do the factors have in common? As the majority of studies on rehabilitation programs document the benefits to cardiovascular health, is it the physiological variable which accounts for improvement in psychosocial variables or vice versa? It was the belief of the investigator that the Salutogenic Model might provide some beginning insights. The relationship of sense of coherence (SOC) to health for the coronary patient is complex. As one's premorbid levels of SOC and GRRs may be predisposing factors to coronary artery disease, one's levels of SOC and GRRs may in turn positively or negatively affect the convalescence and resultant health status. The relationship is depicted in Figure 3. In short, programs may serve as catalysts to influence "feelings of health" and stimulate behavior change to promote adherence to "healthy behavior".

Specifically, the premorbid level of sense of coherence may be related to the health status of coronary prone individuals. This in turn may account for the adaptation post-infarction. A myocardial infarction is therefore viewed as a change resulting in a loss of coherence. To adapt, one restores consistency, meaning and control to life. Cardiac patients with a strong sense of coherence may adapt to change better than cardiac patients with a low sense of coherence. Additionally, life events surrounding the stressor of a myocardial infarction may influence the post-infarction level of sense of coherence, both positively and negatively.

The surgical experience of a coronary artery bypass can also be viewed as a stressor causing downward movement on the sense of coherence continuum. An exercise rehabilitation program specifically designed for cardiac patients can be regarded as a SRR, which in turn, may serve as a catalyst to promote a "change" in sense of coherence.

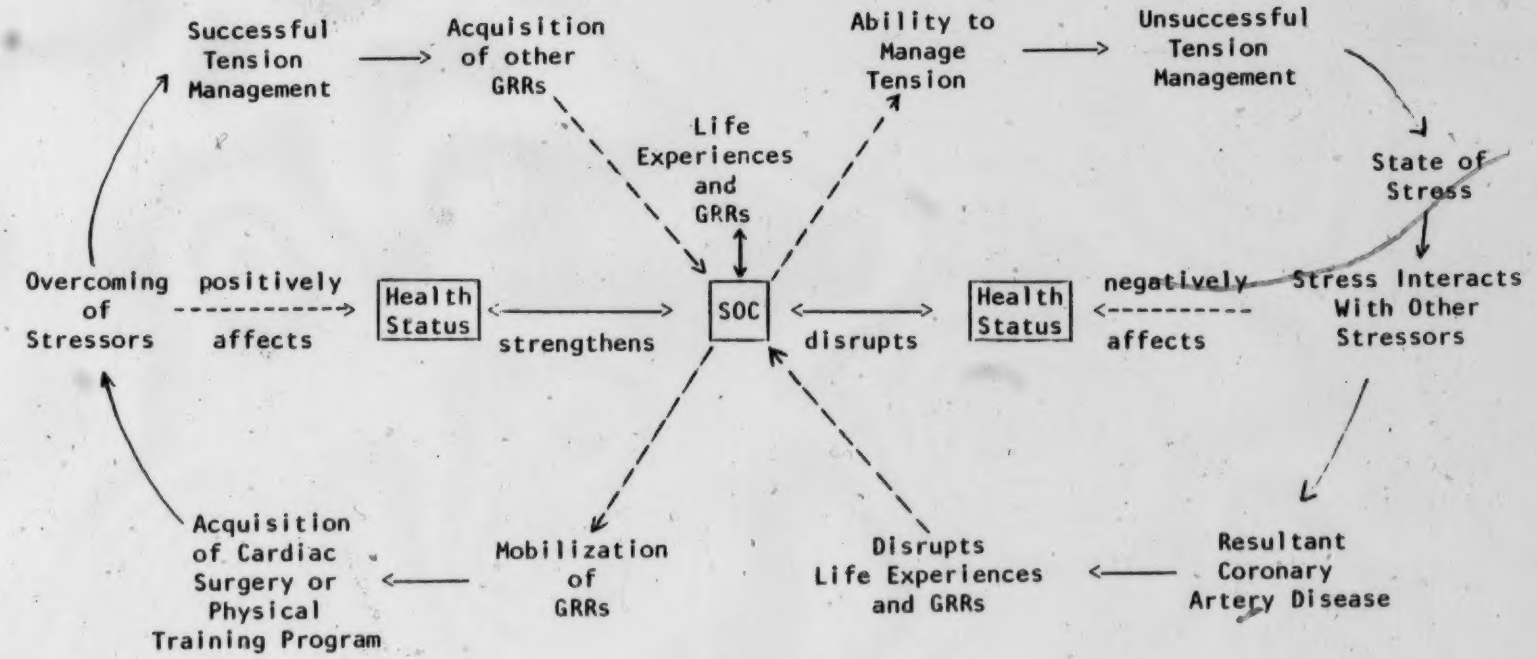
Successful Tension Management
Acquisition of other GRRs
Life Experiences and GRRs
Ability to Manage Tension
Unsuccessful Tension Management
State of Stress
Overcoming of Stressors
positively affects
Health Status
strengthens
SOC
disrupts
Health Status
negatively affects
Stress Interacts With Other Stressors
Acquisition of Cardiac Surgery or Physical Training Program
Mobilization of GRRs
Disrupts Life Experiences and GRRs
Resultant Coronary Artery Disease

Figure 3. Relationship of Sense of Coherence to Health for the Person With Coronary Heart Disease

Measurement Theory

Reliability

Theoretically defined, reliability is the ratio of true score variance over observed score variance (Kerlinger, 1973, p. 446). Therefore a reliability coefficient represents that proportion of test variance that is stable. A measurement can be consistent in several respects: stability over time, over people, over forms, over items. Consistent with these variations, a number of statistical tests can be used to estimate the different forms of reliability depending on the level of data available and the level at which consistency is desirable (Maguire & Hazlett, 1969). A relevant statistical model for this investigation pertaining to a construct is Cronbach's alpha. The alpha coefficient estimates the degree of internal consistency of the instrument or the degree of "unifactoredness".

While reliability is a necessary quality in a measurement instrument, it cannot replace validity, as an instrument may dependably measure a concept other than that intended.

Validity

Validity refers to the accuracy in which an instrument measures what it is suppose to be measuring. Unlike reliability, validity rests upon independent rather than dependent measures. Validity is therefore the most important concept in measurement for it relates to the degree to which an instrument achieves the purposes for which it was designed (Mehrens & Lehmann, 1973). The validity of a measure is subsequently a matter of degree not an absolute quality and four types of validity are generally recognized: face, content, construct and criterion validity.

Face and Content Validity

Face validity refers to the extent to which the instrument appears reasonable and relevant, "on face", to potential test subjects. Moiser suggests that a test ought to possess not only statistical validity, but also practicality and relevance to both subjects and investigators (Moiser, 1967, p. 218).

Content validity pertains to the representativeness or sampling adequacy of the relevant content pool. It pertains to the substance, matter and topics of the measuring instrument. Content validation revolves around the question: Is the content of this measure from and representative of the universe of content of the phenomenon being measured? (Kerlinger, 1973). One model used in estimating content validity uses "experts" to judge items existence in and representativeness of the universe of content. In that only subjective decisions are forthcoming, the model requires the use of many and independent experts. The degree of agreement among such experts is then used as a basis for degree of content validity. Obviously, if those defined as experts are not in high agreement that any particular item does indeed belong in the universe, then such items are usually not regarded as having sufficient validity and are subsequently not used or analyzed.

Construct Validity

"A construct is some postulated attribute of people assumed to be reflected in test performance" (Cronbach & Meehl, 1967, p. 247).

The degree of construct validity established is determined by the degree to which the constructs proposed by theory account for the variance in test performance. In this way, construct validity is tied to a nomological network in that both the instrument and the theory are questioned or supported simultaneously (Mehrens & Lehmann, 1973). Consequently, in this approach, validity is not "proven" but rather supported or not supported by the test results (Polit & Hungler, 1978). Construct validity can be supported to the degree that constructs proposed by theory are reflected in empirical findings.

Factor analysis is one statistical technique of construct validation which is used to identify clusters of related variables. The underlying traits are referred to as factors and are linear combinations of the variables in a data matrix (Polit & Hungler, 1978). Factor analysis therefore provides an empirical method for investigating the possible existence of hypothesized factors existing in the data.

Criterion Validity

"Criterion-related validity pertains to the empirical technique of studying the relationship between the test scores and some independent external measures" (Mehrens & Lehmann, 1973, p. 125). Concurrent validity refers to the use of a criterion instrument at approximately the same time as the instrument under investigation. In predictive validity, the criterion measure is administered at a later date and implies the presumed ability of the instrument under consideration to predict future performance. The degree of validity is determined by the extent to which a predicted relationship is demonstrated and the relationship is usually expressed by a correlation coefficient (Mehrens & Lehmann, 1973). The key issue in criterion validity is the usefulness of the instrument as a predictor and not solely its ability to measure a particular theoretical trait.

Summary of Chapter

The pertinent literature pertaining to this study was reviewed. The evolving conceptualization of health was outlined along with the methodological problems in the measurement of health. Central to this investigation is the evidence relating sense of coherence to health status, specifically the relationship to coronary heart disease. Assumptions were outlined upon which validity estimates for this study are based. Measurement theory which pertains to the study was identified.

The design and validation models utilized in this investigation to achieve the previously stated objective of the study are now outlined in the following chapter.

CHAPTER IV

METHODOLOGY

The conceptual model underlying the research design was Antonovsky's Salutogenic Model of Health (1979). In that there were no existing tools for measuring salutogenesis, the investigator devised an instrument to measure central concepts underlying that model. The sequence of investigation is depicted in Figure 4.

The investigation consisted of the development and determination of the degree of validity of an instrument designed to measure a sense of coherence. Several steps were involved in meeting the previously stated objective of this study. The design of the study will first be outlined, followed by a discussion of the instrument, Health Coherence Attitude Scale (see Appendix I), and the validation models used in this investigation.

Research Design

The design of the study was quasi-experimental, incorporating dependent (repeated) measures. A description of the subjects and setting of the study, data collection procedures, ethical considerations and the data analysis procedures are discussed in the following sections.

Subjects of the Study

Subjects were restricted to those admitted to the University Hospital of Alberta Cardiac Rehabilitation Program between April 1981 and September 1981. Subjects over 65 years of age were excluded from the study due to their more likely limitations related to

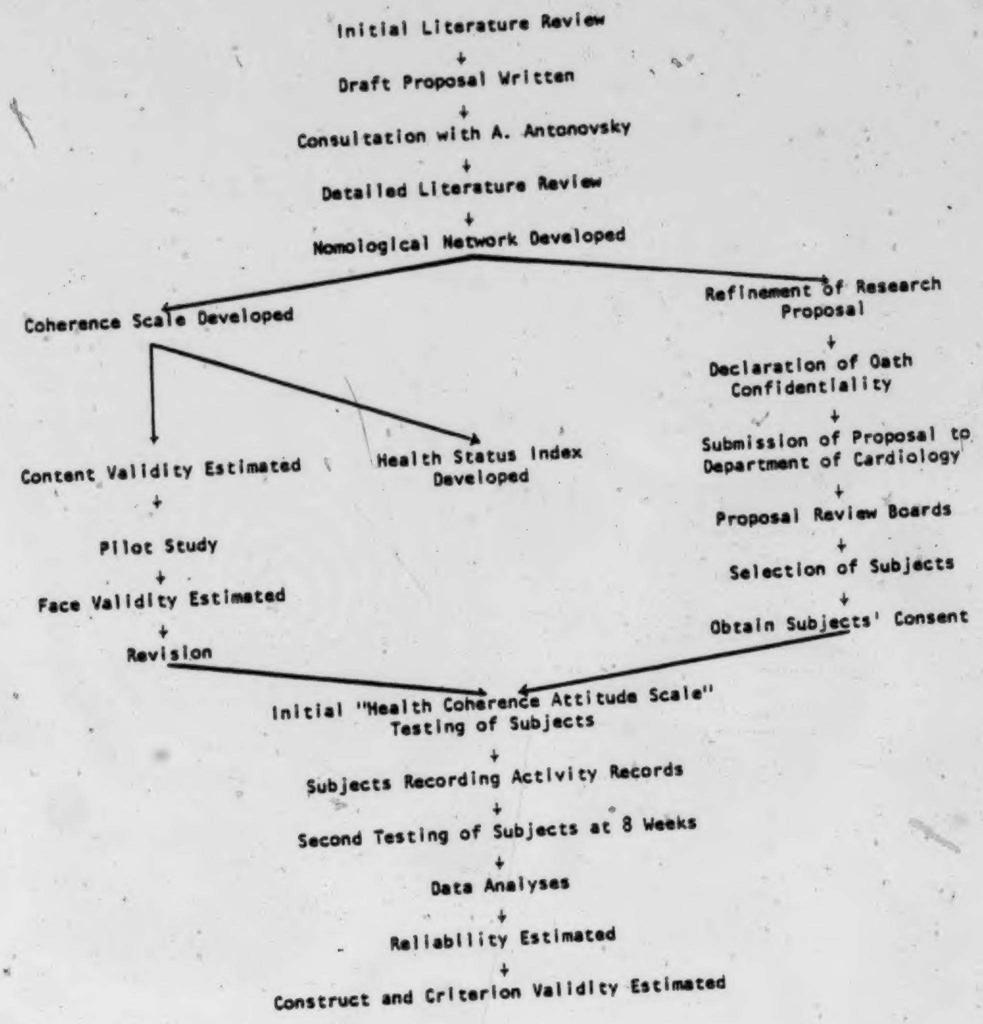
Initial Literature Review
Draft Proposal Written
Consultation with A. Antonovsky
Detailed Literature Review
Nomological Network Developed
Coherence Scale Developed
Refinement of Research Proposal
Declaration of Oath Confidentiality
Submission of Proposal to Department of Cardiology
Proposal Review Boards
Selection of Subjects
Obtain Subjects' Consent
Content Validity Estimated
Health Status Index Developed
Pilot Study
Face Validity Estimated
Revision
Initial "Health Coherence Attitude Scale" Testing of Subjects
Subjects Recording Activity Records
Second Testing of Subjects at 8 Weeks
Data Analyses
Reliability Estimated
Construct and Criterion Validity Estimated

Figure 4. Sequence of Investigation

performing the physical testing procedure. All patients available during the time period were approached and included in the study; in total, 45 were available. Among the 45 subjects, three distinct groups of subjects were identified. Group I (n=17) consisted of male patients currently hospitalized for a myocardial infarction diagnosed by current medical diagnostic procedures. Group II (n=15) consisted of male patients scheduled for coronary artery bypass surgery for coronary artery disease. Group III (n=13) consisted of non-hospitalized male subjects who having had a myocardial infarction, were starting the physical training program.

The groups were identified based upon the assumptions previously outlined in Chapter III (cf. pp. 80-82). From the literature review, assumptions relating a sense of coherence to health status, specifically coronary heart disease, were established. A myocardial infarction and/or cardiac surgery were regarded as a stressor causing a disruption of a sense of coherence. Exercise training for coronary heart disease subjects was viewed as a specific resistance resource (SRR) in that activity was assumed to have a salutary effect of tension. Over time, it was proposed that an improvement in a sense of coherence would be reflected in an improvement in health status. Thus, while Antonovsky maintains that sense of coherence is highly enduring, the investigator anticipated a modification in this attitude to occur over an eight week period.

Setting of the Study

The hospital utilized in this study is a large acute care teaching hospital. Patients admitted with a myocardial infarction or for cardiac surgery received standard medical treatment protocols.

Patient teaching about their medical diagnosis or impending surgery, diagnostic tests, medical treatments and discharge instructions were similar in nature for each patient.

The Cardiac Rehabilitation Program's clinical facility was the specific setting for testing the subjects. The specific protocols of this rehabilitation program were adhered to. The rehabilitation program offers counselling regarding symptoms, activity, excessive weight or other problems, and provides a low level exercise test and a follow-up assessment in eight weeks. At the follow-up assessment, a physical training program of "5 BX" (Royal Canadian Air Force Exercise Program, Appendix II) is offered. Exercise time is split in approximately equal proportions between calisthenics and a stationary run. The frequency of each individual exercise is increased with progression of training. Progression of training is related to conventional protocols of achievement of maximal heart rate, freedom from pain, arrhythmias and undue fatigue experienced during the exercise test.

Data Collection

Upon admission to the Cardiac Rehabilitation Program, subjects' demographic characteristics and coronary risk factor parameters were collected through interview and hospital chart data (see Appendix III). The investigator explained the purpose and nature of the study to the subject and obtained a written consent to participate in the study (see Appendix IV). The research instrument, Health Coherence Attitude Scale, was given to the subjects, and they were required to complete it while in the interviewer's office (though the investigator absented herself while the subject completed the items).

The subject was then taken to the exercise room for a low level exercise test.

For Group I, the initial testing was at seven to 10 days post infarction. These subjects were ambulatory on the hospital ward, free of chest pain for at least two or three days and had no significant ventricular arrhythmias. Group II was tested on admission to hospital one to two days prior to their coronary artery bypass surgery. Group III was tested on the initial assessment prior to their participation in the physical training program. For Group II only, medications were withheld prior to the test in accordance with the program's testing protocols. This was to achieve a more valid result in the posttest, as surgical patients are not routinely on medications or the same ones, post surgery.

For the exercise test, subjects mounted an electrically braked bicycle ergometer. Following attachment of electrocardiogram electrodes, the subjects remained seated on the bicycle ergometer for two to five minutes in order to obtain a steady initial heart rate, blood pressure and resting S-T segment recording. No attempt was made in this study to control for the possible anxiety reaction the subjects may have experienced towards this test. The subjects pedalled at 60 r.p.m. and were presented with increasing work loads at three minute intervals. A continuous electrocardiogram was recorded during the test. The exercise test was administered based on convential criteria for a submaximal exercise test; pain, fatigue, S-T segment depression greater than one millimeter, a drop in blood pressure or increase in systolic pressure greater than 200 mmHg, or heart rate of 80 percent of maximum defined for age.

At eight weeks subjects were tested again using the same exercise test methods and protocols. The Health Coherence Attitude Scale was readministered to determine any change in the variables under study. During the interim period, subjects recorded a weekly summary of their activities (Appendix V). During the follow-up period, no attempt was made to control or account for variables which may influence the level of health or coherence being measured, such as Generalized Resistance Resources (GRRs).

Ethical Considerations

Consent was obtained from the Department of Cardiology to approach their patients for possible willingness to participate in this study. The research proposal was submitted and accepted by the hospital's Scientific and Ethical Review Committee and the Special Services and Research Committee. During data collection, the investigator was responsible to the Medical Director, Cardiac Rehabilitation whose protocol for patient testing was adhered to.

All subjects were informed that a nursing study on factors related to health was being conducted. The administration of the questionnaire, the exercise test and information collected from medical records were explained to subjects as the means of assessment. All were informed that they had the right to refuse to participate in the study without fear of recrimination, and that they could withdraw from the study at any time. The investigator took an oath of confidentiality (Appendix IV). All subjects were verbally assured of confidentiality and their identification was kept by numeric code. A written consent was obtained from each subject (Appendix IV).

Instrumentation

The research instrument, the Health Coherence Attitude Scale (Appendix I), was developed in the following manner.

Content of Items for Inclusion in the Scale

The link between beliefs, attitudes and behavior is complex and one cannot presume that beliefs or attitudes "cause" behavior. One can measure an attitude towards a behavior or social norm which is closely related to behavioral intent, but not behavior in itself. Therefore, sense of coherence theory is built around attitudes and beliefs and not solely overt behaviors, since the meaning of the behaviors to the observer would be lost. Sense of coherence as an attitude is measured by assessing scaled beliefs. Items generated are therefore statements of beliefs.

The following criteria were adhered to in the development of items. All statements were expressions of beliefs and not facts. To believe a fact is true is not equivalent to expressing an attitude. Due to the subjective nature of an attitude, the belief statements generated were purposely left abstract. A specific level of stimulus such as in the belief statement would not meet this subjective criterion. It is the personal evaluation of the stimuli which is essential. For example, seeking help in whatever aspect of how, when, where and why is not the issue but whether the subjective evaluation of seeking help, in general terms, is comprehensible, manageable and meaningful. The more specific the item, the greater the danger arose of the investigator placing her own values and biases in the belief statement.

As an enduring attitude, sense of coherence prevails over time. The time referent to items therefore was not specifically defined by varying the verb tense in the items. Statements were geared to measuring the present attitude of the subject. It is believed that the respondent would consider the past and future in stating his present attitude toward life. This avoided asking the subject to react to two possibly conflicting opinions: one, reflecting his present state of mind and one, his past attitudes.

Item stimuli entail the multiple dimensions of type, source and referent. A cross section of stimuli was attempted in item development. To provide items on the total universe of stimuli was beyond the limitations of this study. Further, the total universe was not considered essential in that one's sense of coherence is viewed as pervasive. It is not the number or type of stimuli which govern the level of sense of coherence, it is a general orientation to life and one's place in that life. It was important to construct items that reflected a belief about the stimulus and not a single response to the stimulus.

An impersonal approach was chosen over the personal approach in developing items. An impersonal approach would cause the respondents to answer more generally with less consideration of personal consequences. In other words, the attitude measured should reflect the total picture of one's world including oneself, family and society. Furthermore, if a personal qualifier were included in the item, the attitude of coherence would be reflected in the items and not in the Likert scaling of the item by the respondent. In short, the items are general belief statements, not attitude statements.

If one views sense of coherence as an attitude, one cannot say that people have "false" attitudes. They may have false beliefs but not false attitudes. Consequently, the 'over-confident' belief is reflected in the positive extreme of the continuum. The 'sad sack' belief is reflected in the negative extreme of the continuum. To avoid any stereotyped response, both positive and negative items were developed, including some extreme items. To achieve this, insertion of qualifiers such as "always" and "never" into items was done, which in turn added the danger of forcing an all or none response.

To emphasize the probability element of coherence, "is" and "can be" statements were developed. If at present "things" seem chaotic, it is the attitude that reason will prevail that was attempted to be measured. Additionally, items measuring meaningfulness should not reflect evaluative statements. For example, "well informed" or "beauty" would imply a "good thing" and would place the investigator's values in the belief statement. Therefore, items in the meaningful dimension were developed to be free from cultural and personal bias. The attitude to be measured was that degree to which life is worthwhile and valued.

The items were developed for the adult age group. This does not mean that the investigator took the position that children will have a low sense of coherence. Sense of coherence develops over time as life experiences unfold. The child may also have a strong sense of coherence based on "his world". This would logically be reflected in the conceptual level of stimuli and in the language of the items presented.

Prototype of the Items

A prototype of the items was developed as follows to assist in the generation of items to measure sense of coherence:

1. Positive End of the Continuum
    a. Items reflecting comprehensibility:
        x and x's place in the scheme of things can be made sense of or are consistent and predictable.
    b. Items reflecting manageability:
        x can be dealt with in the long run or is under a legitimate 'someone's' control.
    c. Items reflecting meaningfulness:
        x can make a difference or is significant, i.e., one cares about x.
2. Negative Extreme of the Continuum
    a. Items reflecting comprehensibility:
        Where x fits cannot be understood or is unknown.
    b. Items reflecting manageability:
        x is not under anyone's control nor can x be dealt with.
    c. Items reflecting meaningfulness:
        x has little or no significance or cannot make any difference.
3. Positive Extreme of the Continuum
    a. Items reflecting comprehensibility:
        x and x's place in the scheme of things is always known (even if it can't be known).

b. Items reflecting manageability:

x is manageable under all circumstances (even if it it's not).

c. Items reflecting meaningfulness:

x is significant under all circumstances (even if it's not).

Measurement of Sense of Coherence

Interpreting sense of coherence as an attitude of the person lends it to being measured by a Likert scale (Fishbein & Ajzen, 1975). The continuum adopted was divided into six continuous intervals ranging from (1) strongly disagree to (6) strongly agree. It was assumed that the use of a six point scale would produce optimal discrimination amongst responses. As some items were worded positively and others negatively, the score on each negative item was subtracted from seven before a total score for each respondent was derived by summing the weights of all items in the scale. This arbitrary method of scoring item responses assumes equidistance between response alternatives, procuding an interval scale.

Measurement of Health

The first four items comprising the second section of the Health Coherence Attitude Scale were a modification of Antonovsky's four facets of health; a fifth item was added which requested the subjects to rate their health on a ladder from (0) worst possible health to (8) best possible health. A summed raw score was calculated, based on the five items, using each category number as a score, so that the lower the score, the less the departure from "complete health". This was adopted as a criterion measure as it was operationally defined in the Salutogenic Model.

Self-deception, denial and/or unrealistic expectations of subjects introduces biased answers in the measurement of health status. Therefore, as an objective measurement of health status, a cardio-respiratory index based on a submaximal exercise test was added. Physiological parameters measured were: total work (Kpm), maximum heart rate, double product (maximum heart rate x maximum systolic blood pressure) and the presence of pain, fatigue, dyspnea or arrhythmias (see Appendix III).

Reliability Estimates of the Health Coherence Attitude Scale

Cronbach's alpha coefficient was used to establish the degree of reliability of the Health Coherence Attitude Scale. Specifically, the internal consistency of the scale was assessed. As measurement of a multidimensional construct was assumed a priori a low alpha coefficient was anticipated.

Additionally, a test-retest correlation was compared as a reliability coefficient to establish the stability of the attribute measured over time. Since a sense of coherence might be presumed to be a fairly stable attribute in individuals, one would expect a measure of it to yield consistent scores on two separate testings. In this study, a change in coherence was anticipated a priori over time. The expected change was considered a limitation for this approach to estimating reliability in that attitudes may be modified over time, independent of the stability of the measure.

Validity Estimates of the Health Coherence Attitude Scale

The following steps were taken to establish the validity of the Health Coherence Attitude Scale.

Content Validity

Based upon the prototype of items, the investigator generated items considered to be representative of the components of the content relevant for a sense of coherence. All items were submitted to 11 content experts. This panel of item reviewers was considered expert in one or more of the areas of health, attitude measurement, conceptual clarification or instrument development. The panel members consisted of Dr. A. Antonovsky; a sociologist; a mental health consultant; a theoretical psychologist; and seven nurses qualified at the doctoral level, with expertise in nursing research.

These content experts were asked to respond to:

1. the relevancy of each item to the theory of the model;
2. the clarity, ease of understanding and lack of ambiguity of items; and
3. the question of whether a representative sample of the universe of items had been achieved (see Appendix VI).

The criterion of 90 percent inter-judge agreement was established *a priori* for inclusion of acceptable items in the scale.

Pilot Study

Items meeting the criterion from content expert appraisal were chosen and the format of the questionnaire was developed. The scale was then pilot tested on a group of 67 subjects: nursing students, registered nurses and family members of these nurses.

A further step utilized in establishing the criterion for inclusion or exclusion of items in the scale was the submission of responses of the pilot group to factor analysis procedures. Only items having factor loadings of 0.400 or greater on interpretable factors and having communalities greater than 0.200 were retained. Based on these criteria, the items constituting the final scale were selected.

Face Validity

An estimate of face validity was established by assessing comments of the individuals of the pilot study. The participants were asked to comment on the wording and presentation of the scale and the directions for clarity of meaning. Each individual reviewed items for their applicability, lack of ambiguity and ease of understanding. The response time of the scale was assessed. Based on these comments modifications were made.

The comments of the respondents in the main investigation also served as an estimate of face validity. The responses will be discussed in the findings of this study (cf. Chapter V, pp. 113-114).

Construct Validity

The steps undertaken to estimate construct validity are outlined in Figure 5. In this study, factor analysis was one statistical procedure used to estimate construct validity of the Health Coherence Attitude Scale. The chief purpose of the analysis was to delineate the extent to which factors emerged as predicted by

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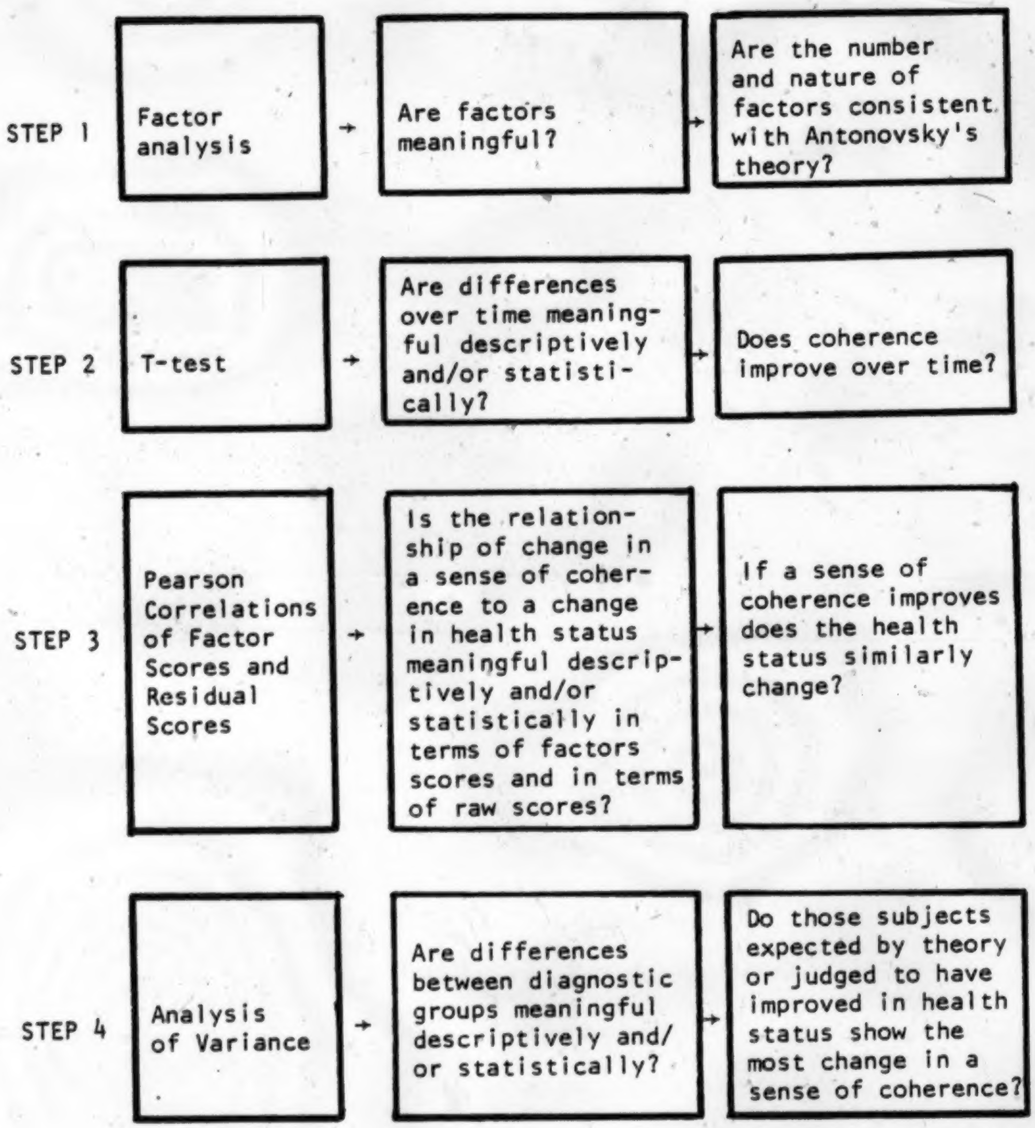
STEP 1
Factor analysis
Are factors meaningful?
Are the number and nature of factors consistent with Antonovsky's theory?
STEP 2
T-test
Are differences over time meaningful descriptively and/or statistically?
Does coherence improve over time?
STEP 3
Pearson Correlations of Factor Scores and Residual Scores
Is the relationship of change in a sense of coherence to a change in health status meaningful descriptively and/or statistically in terms of factors scores and in terms of raw scores?
If a sense of coherence improves does the health status similarly change?
STEP 4
Analysis of Variance
Are differences between diagnostic groups meaningful descriptively and/or statistically?
Do those subjects expected by theory or judged to have improved in health status show the most change in a sense of coherence?

Figure 5. Steps in Establishing Construct Validity.

Antonovsky's theory. It was hypothesized that the scale, if construct valid, would result in a three dimensional solution, which could be interpreted to be comprehensibility, manageability and meaningfulness.

To further establish the degree of construct validity, the extent to which the construct proposed by the Salutogenic Model, "sense of coherence", accounted for variance in test performance was examined. A t-test was carried out to determine any meaningful differences between the pretest and posttest scores on the Health Coherence Attitude Scale. It was hypothesized that health status as reflected in one's sense of coherence changes in response to a stressor. The stressor was defined as a myocardial infarction or coronary bypass surgery for this subject group.

Additionally, the relationship of change in a sense of coherence to a change in health status was determined in terms of raw scores and in terms of factor scores. It was hypothesized that an improvement in a sense of coherence would similarly account for an improvement in health status of the subjects.

The Health Scale based on Antonovsky's four facets of the health ease/dis-ease continuum was considered an independent measure of the proposed construct. This profile was intended to yield data on the health status of subjects. However, with the homogeneity of individuals in this study, the variation of health across subjects was problematic. With health viewed as being both subjectively and objectively defined, the quantifiable physiological parameters from a submaximal exercise test were used as a further objective criterion measure.

A change in the criterion measures (health) and predictor measure (sense of coherence) were obtained by calculating residual scores. A residual posttest score (R) was calculated by using the pretest score (A) to predict the posttest score (B). It is known that this residual score is more reliable than a difference score between the pretest and posttest since, "as the correlation departs in a positive direction from zero, the error variance accounts for an increasing proportion of the total variance of differences, with a resulting increase in reliability" (Ferguson, 1976, p. 432).

Pearson correlation coefficients were then determined between mean factor scores and the residual scores of the Health Index and Physical Fitness measures (health variables) as well as between the residual scores of the Coherence Scale (sense of coherence variables) and the residual scores of the health variables.

Finally, to further investigate the construct of sense of coherence, mean differences among groups were assessed. A one-way analysis of variance was carried out using the three groups chosen for this study: Group I, recent myocardial infarction subjects; Group II, coronary surgical subjects; and Group III, exercise training subjects. It was hypothesized that there would be no mean differences amongst the three groups because they were assumed homogeneous with respect to health status reflected in a sense of coherence, and the degree of change anticipated.

Additionally, the total subjects (n=45) were divided into two groups. Group A (n=23) consisted of subjects who were considered to be weakest in the variables under study or who were classified as "no improvement" by subjective evaluation of the investigator during the posttest interview. Group B (n=22) consisted of those subjects who were considered to be strongest in the variables under study or who showed "improvement". If the Health Coherence Attitude Scale is an accurate indicator of the construct and the investigator's judgement was correct, the scale should distinguish between these two groups. A two-way repeated measures analysis of variance was performed. It was hypothesized that mean differences would exist between Group A and Group B on the pretest and posttest scores.

Predictive Validity

The origins of health are considered to be found in a sense of coherence. Stepwise multiple regression analysis was used to estimate the degree of predictive validity of a sense of coherence. Residual scores on the Coherence Scale along with demographic data and risk factor profile of the subjects (Appendix III) were subjected to regression analysis to predict health status. It was hypothesized that a sense of coherence would account for the most variance between the actual and predicted values of health status.

Power

When hypotheses are tested under the null assumption, it is necessary to have adequate statistical power if the rejection of or failure to reject the null is to be used as supporting evidence for construct validity. In this study, unless differences were of the order that Cohen (1977) describes as large or even greater, the statistical power of any analysis done on construct and predictive validity would have been inadequate (i.e., less than 0.800). Therefore the power of this study is not considered sufficient to adequately demonstrate relationships of measured sense of coherence and related variables. For this reason statistical analyses were not only subjected to significance test with alpha two-tailed set at 0.05, but the investigator also examined descriptive directional differences to estimate possible construct validity.

Summary of Chapter

A dependent (repeated measures) design was utilized to investigate the construct, a sense of coherence. This study constituted an initial step in looking at the complex relationship between attitudes and health through exploring definitional and measurement issues related to the concepts in question. Development and scoring of the Health Coherence Attitude Scale were discussed. Reliability and validity studies with statistical models chosen to assess the responses of subjects were outlined as they related to meeting the objectives of the study.

A discussion and interpretation of research findings is presented in the following chapter.

CHAPTER V

PRESENTATION AND DISCUSSION OF RESEARCH FINDINGS

The overall objectives of the study were to develop and investigate the degree of validity of the Health Coherence Attitude Scale. The research findings are discussed in relation to the objectives of the study and the specific research questions outlined in Chapter I related to the framework of Antonovsky's Salutogenic Model of Health (1979).

This chapter is divided into three sections. The first section describes the characteristics of the subjects while the remaining sections delineate reliability estimates and report the results of the validation studies of the Health Coherence Attitude Scale (Appendix I). In that this investigation did not have adequate statistical power, all findings are discussed in light of this major limitation.

Characteristics of Subjects

The study consisted of 45 male coronary heart disease subjects who met the criteria for inclusion in the study. Of the 45 subjects, 17 had a recent myocardial infarction (Group I), 15 had coronary artery bypass surgery (Group II) and 13 had recently commenced the Cardiac Rehabilitation Program's exercise training (Group III). All subjects approached for inclusion in the study gave written consent without hesitation.

Of the 45 subjects, four did not complete the study. One subject from out of the city was unwilling to come for follow-up testing. One subject experienced angina following his surgery and was scheduled for a repeat coronary artery bypass. Therefore, a post exercise test was not done, but the subject did consent to completing the questionnaire following his second surgery. Another subject did not complete his exercise program and the investigator was unable to reach him by telephone. The fourth subject was going on holidays and did not wish to come to the hospital for retesting.

The age range of subjects was between 30 to 65 years, with the largest percentage (26.7%) being between 60 to 65 years and 24.4% between 48 to 53 years. The subjects were married (95.6%) with family responsibilities. The majority were employed in professional or skilled occupations (77.8%) with approximately half (57.8%) working full time prior to hospitalization. Specific occupations ranged from physicians, engineers, self-employed businessmen to pilots, supervisors of labor operations, farmers and salesmen. Due to complications associated with their health status such as dyspnea, angina or congestive heart failure, 12 subjects (26.7%) were unable to undertake any employment.

Of the 45 subjects, 24 had had a previous myocardial infarction. Thirteen subjects had additional health problems such as diabetes, hypertension, gastric ulcers or diverticulitis. The three groups were homogeneous in terms of those and all other demographic variables studied. Further descriptions of the subjects' characteristics are outlined in Table 1.

A risk factor profile for coronary artery disease was outlined for each subject. Of the 45 subjects, 49 percent had a

Table 1: Characteristics of Subjects

Characteristic		Absolute Frequency	Relative Frequency (Percent)	Group Absolute Frequencies		
				Grp I* n=(17)	Grp II* (n=15)	Grp III* (n=13)
AGE	30-35 years	2	4.4	0	0	2
	36-41 years	3	6.7	3	0	0
	42-47 years	7	15.6	3	1	3
	48-53 years	11	24.4	2	7	2
	54-59 years	10	22.2	5	3	2
	60-65 years	12	26.6	4	4	4
MARITAL STATUS	Single	1	2.2	0	1	0
	Married	43	95.6	16	14	13
	Separated	1	2.2	1	0	0
SOCIAL SUPPORT STATUS	Friends Only	2	4.4	1	1	0
	Family & Friends	43	95.6	16	14	13
OCCUPATION	Professional	13	28.9	3	3	7
	Skilled	22	48.9	10	8	4
	Semi-Skilled	5	11.1	3	1	1
	Laborer	5	11.1	1	3	1
CURRENT EMPLOYMENT STATUS	Full Time	26	57.8	10	11	5
	Part Time	3	6.7	0	1	2
	Retired	2	4.4	1	0	1
	Unemployed	2	4.4	0	1	1
	Unable to Work	12	26.7	6	2	4
PREVIOUS MYOCARDIAL INFARCTION	None	16	35.6	6	9	1
	One	24	53.3	8	5	11
	Two	5	11.1	3	1	1
ADDITIONAL HEALTH PROBLEMS	No	32	71.1	11	12	9
	Yes	13	28.9	6	3	4
COMPLICATIONS ASSOCIATED WITH HEALTH STATE	No	32	71.1	13	12	7
	Yes	13	28.9	4	3	6
PRESCRIBED MEDICATIONS	None	6	13.3	2	1	3
	Nitrates/Vasodilators	3	6.7	2	0	1
	Beta Blockers	4	8.9	2	0	2
	Other	14	31.1	2	11	1
	Combination of Drugs	18	40.0	9	3	6

*Group I Recent Myocardial Infarction Subjects
Group II Coronary Surgical Subjects
Group III Exercise Training Subjects

body weight greater than the mean for their height. Eighty-seven per cent reported having no, or only occassional exercise. Additionally, 82 per cent described themselves as having a mild to moderate degree of stress related to family, work or finances. A family history of coronary artery disease was evident in 60 per cent of the subjects. Finally, 58 per cent admitted to smoking one or more packs of cigarettes per day. The risk factors are further identified in Table 2.

Results of Statistical Analysis

Establishment of Content Validity

From the 140 original items written, 60 met the criterion of 90 per cent agreement amongst the content experts as to the relevance and representativeness of the items. The 60 items were chosen with 20 items in each of the three factors proposed *a priori* as comprehensibility, manageability and meaningfulness to provide for equal weighting. These items had the least revisions suggested to enhance the clarity of meaning. Minor revisions in wording were carried out.

The 60 items of the scale were then piloted tested on 67 subjects: 41 nursing students, 15 registered nurses and 11 non-nursing people. The latter were family members of the nursing students. The age range of subjects was 16 years to 60 years, with the largest percentage between 26 and 30 years. The responses of the pilot study were subjected to factor analytic procedures. Three interpretable factors emerged which corresponded to the dimensions determined *a priori* as comprehensibility, manageability and meaningfulness.

Table 2. Risk Factor Profile (n=45)

Risk Factor		Absolute Frequency	Relative Frequency (Percent)	Group Absolute Frequencies		
				GrpI(n=17)*	GrpII(n=15)*	GrpIII(n=13) *
BODY WEIGHT FOR HEIGHT	Less Than Mean	5	11.1	3	1	1
	Mean	18	40.0	9	7	2
	Greater Than Mean	22	48.9	5	7	10
CURRENT SMOKING STATUS	Not a Smoker	19	42.2	6	6	7
	Less Than I Pack/Day	11	24.4	5	4	2
	I Pack/Day	13	28.9	5	5	3
	More Than I Pack/Day	2	4.4	1	0	1
EXERCISE HABITS	No or Occassional Exercise	39	86.7	14	15	10
	Regular Exercise	6	13.3	3	0	3
PHYSICAL ACTIVITY	Sedentary and Light Work	34	75.6	14	9	11
	Moderate to Heavy Work	11	24.4	3	6	2
STRESS DEFINED	None	2	4.4	1	0	1
	Mild	20	44.4	9	6	5
	Moderate	17	37.8	5	9	3
	Severe	6	13.3	2	0	4
FAMILY HISTORY	No	18	40.0	9	4	5
	Yes	27	60.0	8	11	8

* Group I Recent Myocardial Infarction Subjects; Group II Coronary Surgical Subjects; Group III Exercise Training Subjects

Thirty items were retainable for inclusion in the scale on the basis of meeting the criterion of factor loadings greater than 0.400 in each of the three interpretable factors which emerged and a communality of 0.200 or above. However, few of the 30 items retained following factor analysis loaded on the factors interpreted to be meaningfulness and comprehensibility. Therefore, ten additional items were developed: one judged to measure manageability, four judged to measure meaningfulness and five judged to measure comprehensibility. These new items were developed to equalize the number of items in each factor defined a priori to provide the 40 items of the Coherence Scale. The items were reviewed with one content expert who verified the investigator's interpretation of the factors and relevancy of new items. Once again, minor revisions in wording of items were necessary.

To avoid response set, the order of these 40 items was randomly determined having a final distribution as indicated below.

Items reflecting comprehensibility:

POSITIVE ITEMS: 5 9 22 25 27 34

NEGATIVE ITEMS: 3 12 14 16 28 31 35

Items reflecting meaningfulness:

POSITIVE ITEMS: 2 6 8 11 15 17 20 29 32 36 38 39

NEGATIVE ITEMS: 23 26

Items reflecting manageability:

POSITIVE ITEMS: 7 10 13 19 21 30 33

NEGATIVE ITEMS: 1 4 18 24 37 40

Each a priori defined dimension had an equal number of items. However, the dimension of meaningfulness had fewer negative items in relation to the other two dimensions. This was considered a possible source of measurement error to be considered in the estimation of construct validity.

Furthermore, content validity refers to the representativeness of the subject matter of the measuring instrument. A variety of experts was utilized to establish content validity. Although these individuals had expertise essential to assessing research instruments, it could be argued that the only true "content expert" was Antonovsky himself. Despite the fact that the panel of content validators was provided with criteria for judging each item, the theoretical framework was unfamiliar to the majority of them. This necessitated the panel relying on the investigator's interpretation of the proposed theoretical framework in order to critique the questionnaire items.

As the total universe of stimuli (type, source and referent) was not attempted, the investigator questions what effect the choice of stimuli may have had on the response of subjects. With coherence being conceptualized as pervasive, the type of stimuli was not considered important by the investigator. However, future validation procedures should verify if the items did illicit a response to the stimulus alone, rather than the "belief" about the stimulus as proposed.

The content question of "general versus specific" levels of stimuli in the belief statements should be a further source of study. The level of abstraction of the items may not have achieved the goal of a specific measurement. To add to this abstractness, the impersonal approach chosen in developing items may not have achieved the purpose intended. Perhaps personalized items would have reflected individual attitudes concerning oneself, family and society as referents.

The pilot test subjects utilized for additional content validation were essentially "healthy" people. The effect of one's health state may have influenced the subjects' interpretation of the content of items. This could have been a source of error, leading the investigator to incorrectly label items a priori as comprehensible, manageable or meaningful. In sum, a degree of content validity was established in this study. However, the limitations discussed raise questions as to the adequacy of the content of the construct being measured. This in turn would limit the degree to which the concept is reflected in test performance, essentially the construct validity.

Establishment of Face Validity

The 67 individuals who participated in the pilot test indicated that the items on the Health Coherence Attitude Scale appeared reasonable and relevant to the stated purpose of the questionnaire. Based upon their comments, a few minor revisions were made to enhance clarity of items. Using a table of random numbers, the items were reordered to avoid the response to one item systematically affecting the response to another. The average time required to respond to the questionnaire was 20 minutes and was therefore not considered to be too tedious for the subjects.

Face validity refers to the practicality and relevance of the items in the questionnaire for test subjects. The level of interpretation required in the items of the Health Coherence Attitude Scale did not appear to pose a problem for the study subject group. However, with differing educational or cultural groups, the terminology utilized may need to be reconsidered. The overall design of the questionnaire was not problematic for subjects in answering the items. No questions were raised by the subjects to clarify the directions given. All items were answered by each subject. The comment section provided at the completion of the questionnaire elicited only a few responses regarding the subject's personal health status. Two subjects commented on the "repetitiveness of ideas" found amongst the items.

Therefore, in this study, a degree of face validity was established. However, face validity was limited in the following respects:

1. The pilot subjects utilized to establish face validity were not representative of the study subjects.
2. The revised final questionnaire was not subjected to face validation procedures.

Establishment of Reliability

Coherence Scale

The reliability coefficient of the Coherence Scale estimated using Cronbach's alpha was 0.845. As Cronbach's alpha is a measure of unifactoredness or internal consistency of the items, a high coefficient such as the one obtained suggested that the Coherence Scale is primarily a measure of one factor (Cronbach, 1967, p. 154).

However, since the alpha coefficient was not 1.0, what may be termed "error" in measurement theory of reliability via this model may in part, reflect the desired multidimensionality of the coherence construct sought in this study.

Since three factors had been proposed a priori as the dimensions of the space called sense of coherence, the reliability for each set of items intended to measure each factor was obtained. Cronbach's alpha for items thought a priori to measure comprehensibility, manageability and meaningfulness was 0.856, 0.882 and 0.891, respectively (values cited have been adjusted to the total scale length via the Spearman-Brown Prophecy Formula). Items thought a priori to measure comprehensibility reflected the highest degree of within factor heterogeneity, with 55.93 per cent of inter-item variance, suggesting error or further multidimensionality.

The reliability estimates on the posttest closely paralleled the initial estimates, with the Coherence Scale having a Cronbach's alpha of 0.860. Again items thought a priori to measure comprehensibility had the greatest inter-item variance with a Cronbach's alpha of 0.742. Items measuring manageability and meaningfulness paralleled the pretest with an alpha of 0.900 and 0.929 respectively, on the posttest (again values for subscales have been adjusted to the total scale length via Spearman-Brown Prophecy Formula).

The reliability coefficient between the summed scores of the Coherence Scale on the pretest and posttest was 0.849. This estimate reflects the consistency in the order and proportion of the attribute measured over time. The correlation between pretest and posttest scores of comprehensibility, manageability and meaningfulness were 0.744, 0.825 and 0.679 respectively. The least consistency over time appears to be with the factor meaningfulness. (See Table 3 for a complete description of reliability estimates of the Coherence Scale.) Although sense of coherence was presumed to be a fairly stable attribute in individuals yielding a consistent score on two separate occassions, this investigator anticipated a modification of the attitude over time. The high correlation obtained could be interpreted as the stability of the measurement; however, as a low correlation was expected *a priori*, it is also possible to regard the findings as evidence that the attitude in question was not modified.

Health Measures

The Health Index had a reliability coefficient, estimated using Cronbach's alpha, of 0.797 on the pretest and 0.768 on the posttest. The 37.49% and 41.99% of inter-item variance respectively, may reflect "error" or the multidimensionality of the concept health. The reliability coefficient between the summed score of the Health Index on the pretest and posttest was 0.308. This would indicate that 91.52 per cent of the variance is due to inconsistency of the attribute measured over time (a not unexpected result since it was anticipated that the health status of subjects would improve).

The other health variables were examined in terms of their consistency over time. The variable of work performed on the pretest, correlated 0.693 with the work performed on the posttest. The variables of heart rate and double product on the pretest correlated 0.644 and 0.648 with heart rate and double product results on the posttest, indicating a degree of consistency of measurements over

TABLE 3. Reliability Estimates of the Coherence Scale

COHERENCE SCALE

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Total Items						
Pretest	4.850	2.600	5.778	3.178	2.223	0.602
Posttest	4.1117	2.595	5.190	2.595	2.000	0.725
Inter-Item Correlations						
Pretest	0.132	-0.405	0.684	1.089	-1.670	0.035
Posttest	0.059	-0.459	0.562	1.021	-1.226	0.042

Alpha Coefficient - Total Items

Pretest 0.84479 **Standardized Item Alpha** 0.8592

Posttest 0.86007 **Standardized Item Alpha** 0.88694

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Comprehensibility Items						
Pretest	4.208	2.600	5.118	2.578	1.991	0.784
Posttest	4.112	2.595	5.190	2.595	2.000	0.725
Inter-Item Correlations						
Pretest	0.110	-0.236	0.605	0.841	-2.551	0.038
Posttest	0.588	-0.458	0.562	1.021	-1.225	0.042

Alpha Coefficient - Comprehensibility Items

Pretest 0.856**

Posttest 0.742**

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Manageability Items						
Pretest	4.849	4.022	5.377	1.355	1.337	0.190
Posttest	4.866	4.261	5.357	1.095	1.256	0.113
Inter-Item Correlations						
Pretest	0.154	-0.137	0.582	0.719	-4.244	0.034
Posttest	0.214	-0.124	0.684	0.809	-5.489	0.029

Alpha Coefficient - Manageability Items

Pretest 0.882**

Posttest 0.900**

TABLE 3 (Continued). Reliability Estimates of the Coherence Scale

COHERENCE SCALE

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Meaningfulness Items						
Pretest	5.446	4.644	5.777	1.133	1.244	0.112
Posttest	5.391	4.857	5.666	0.809	1.166	0.066
Inter-Item Correlations						
Pretest	0.210	-0.166	0.639	0.806	-3.837	0.035
Posttest	0.274	-0.047	0.745	0.793	-15.770	0.031

Alpha Coefficient - Meaningfulness Items

Pretest	0.891**
Posttest	0.929**

**(Values adjusted by Spearman-Brown Prophecy Formula)

Pretest Posttest Coefficients

	Correlation	2-Tail Probability
Coherence Scale	0.849	0.000 *
Comprehensibility Score	0.744	0.000 *
Manageability Score	0.825	0.000 *
Meaningfulness Score	0.679	0.000 *

*Indicates Significant at 0.05 level.

time. (See Table 4 for reliability estimates of the health measures.) It was anticipated a priori that an improvement in health as measured by the physiological parameters would occur. This change was reflected in the correlation coefficients, however, not to the same extent as the subjective perception of health state as measured by the Health Index.

Establishment of Construct Validity: Factor Analysis

Coherence Scale

All responses from the 40 item Coherence Scale were analyzed for orthogonal and oblique principal axis factor solutions. The most interpretable solution was found using a three factor oblique pattern rotation. Factor I and Factor II had eigenvalues greater than three; totally, the three factors accounted for 38.10 per cent of the variance. Each factor will be discussed separately.

(a) Factor I

Factor I had an eigenvalue of 7.543 accounting for 18.90 per cent of the total variance of the Coherence Scale or 49.60 per cent of the variance explained by the three factors. Items loading 0.400 or greater included those related to life being perceived as worthwhile, or of value to become involved in. Life is seen as having "bearable" rewards. This first factor was termed "meaningfulness". Items with loadings of 0.400 or greater are as follows:

Item

6. Seeking help with problems is useful.
7. Life's ambitions can be planned.
8. Having responsibilities in life is gratifying.
11. Solving problems is satisfying.

Table 4. Reliability Estimates of the Health Measures

HEALTH INDEX

	Mean	Minimum	Maximum	Range	Max/Min	Variance
Total Items						
Pretest	2.866	2.044	3.422	1.377	1.673	0.307
Posttest	2.504	1.952	3.000	1.047	1.536	0.006
Inter-Item Correlations						
Pretest	0.466	0.338	0.559	0.221	1.652	0.006
Posttest	0.439	0.333	0.529	0.195	1.585	0.004

Alpha Coefficients - Health Index

Pretest	0.79694	Standardized Item Alpha	0.81391
Posttest	0.76822	Standardized Item Alpha	0.79665

Pretest Posttest Coefficients

	Correlation	2-Tail Probability
Health Index Score	0.308	0.048 *
Work (kpm)	0.693	0.000 *
Heart Rate (beats/min)	0.644	0.000 *
Double Product (max H.R. x max S.B.P.)	0.648	0.000 *
Pain	0.180	0.261
Fatigue	0.242	0.127
Arrhythmias	0.497	0.001 *
Dyspnea	0.179	0.263

*Indicates significant at 0.05 level.

15. Feeling despair at times is natural.
19. It is reasonable having rules to guide life.
20. Having a purpose in life is worthwhile.
21. Feeling helpless can be overcome.
22. One can compensate for a lack of strength and energy.
27. Love is dependable.
29. Every day of one's life counts.
30. Measures can be taken to prevent illness.
33. Personal limitations can be accepted.
36. Each individual has his own merit.
38. Every experience in life is useful.
39. One can learn from mistakes.

(b) Factor II

Factor II had an eigenvalue of 4.789 accounting for 12.00 per cent of the total variance of the Coherence Scale or 31.49 per cent of the variance explained by the three factors. Aspects of coherence described by Factor II primarily related to life being "accidental" and "out of control", of things happening without bearable solution. This second factor was called "powerlessness" as this dimension had high negative loadings. Items loading 0.400 or greater are as follows:

Item

3. People are unpredictable.
4. Goals are never reached no matter how hard one works.
12. Day to day life is chaotic.
14. What lies ahead is never known.

16. One cannot rely on support from others.
18. Information provided is seldom understandable.
24. Perserverance never makes a difference in the end.
28. Taking risks is dangerous.
31. Doing one's best is never enough.
35. Life is a guessing game.
37. Being optimistic seldom makes sense.
40. Help one receives is seldom adequate.

(c) Factor III

Factor III had an eigenvalue of 2.893 accounting for 7.20 per cent of the total variance of the Coherence Scale or 18.89 per cent of the variance explained by the three factors. The dominant theme in the items loading 0.400 or greater under Factor III related to life being inconsistent, of things not being understandable. Life is seen as "consistently pointless". This factor was labelled "ambiguity". Items with loadings of 0.400 or greater are as follows:

Item

1. Physical health is largely determined by luck.
9. Relationships with others are dependable.
23. Changing is seldom worth the effort.
25. There is no limits to what one can achieve in life.
26. Having values to live by is pointless.

The factor correlation matrix indicates a negative relationship between Factor I and Factor II (-0.102). There was a positive relationship between Factors I and III (0.077), as well as between Factors II and III (0.045). Refer to Table 5 for a complete listing of the factors and the correlation matrix.

Table 5. Coherence Scale Major Variables: Oblique Primary Factor Pattern Matrix

Item #	Variable Description	Pretest				Posttest			
		Factors				Factors			
		Communality	I	II	III	Communality	I	II	III
1	Manageability	0.46658	0.02422	-0.35416	0.59625	0.20473	0.45616	0.00061	-0.11718
2	Meaningfulness	0.24650	0.25701	-0.39523	-0.06040	0.45464	-0.13260	0.19211	0.65900
3	Comprehensibility	0.35843	-0.22990	-0.48053	-0.27512	0.21534	-0.33617	0.29990	0.22882
4	Manageability	0.51792	0.08095	-0.59070	0.41145	0.24338	0.42365	0.22251	-0.08563
5	Comprehensibility	0.11476	0.29618	0.12122	0.11492	0.51871	-0.04630	0.01976	0.72505
6	Meaningfulness	0.28280	0.52599	0.12209	0.03463	0.59365	0.30348	-0.14623	0.65951
7	Manageability	0.26595	0.45527	-0.19337	-0.08900	0.26214	0.22640	0.27770	0.30027
8	Meaningfulness	0.55746	0.62558	-0.34924	-0.01289	0.46388	0.15734	0.05529	0.63158
9	Comprehensibility	0.38605	0.19619	0.14065	-0.59922	0.43447	-0.01116	-0.30375	0.60096
10	Manageability	0.13738	0.21439	-0.23377	-0.16885	0.26342	0.37327	0.22402	0.17561
11	Meaningfulness	0.30866	0.47173	-0.00941	-0.32983	0.46002	0.43304	-0.11509	0.45973
12	Comprehensibility	0.50877	0.19478	-0.65764	0.12526	0.43916	0.12070	0.63692	-0.11852
13	Manageability	0.20609	0.35803	0.23793	0.16228	0.29282	0.17596	-0.06260	0.48566
14	Comprehensibility	0.34596	-0.14894	-0.57643	0.13964	0.36924	-0.17819	0.60020	-0.02336
15	Meaningfulness	0.70088	0.73293	-0.19074	-0.36549	0.24133	0.33396	0.03641	0.30367
16	Comprehensibility	0.38846	-0.00312	-0.61251	-0.09237	0.39130	-0.10646	0.38305	0.49054
17	Meaningfulness	0.23576	0.12602	0.23124	0.39558	0.09991	0.30476	-0.06502	0.05023
18	Manageability	0.56502	0.04915	-0.72904	0.18565	0.61912	0.18047	0.62503	0.35884
19	Manageability	0.29862	0.41618	-0.11276	-0.34913	0.63884	0.49384	0.32201	0.42054
20	Meaningfulness	0.43913	0.60974	-0.20642	-0.05614	0.59649	0.69499	0.08016	0.21361
21	Manageability	0.46427	0.67987	0.16563	-0.02443	0.54461	0.71674	0.03473	0.07791
22	Comprehensibility	0.38658	0.54762	-0.09443	0.22398	0.39089	0.53328	0.15499	0.17736
23	Meaningfulness	0.47071	-0.08150	-0.26188	0.65059	0.65106	0.45660	0.62452	-0.07013
24	Manageability	0.3330	0.34658	-0.42712	0.01375	0.21444	-0.02085	0.44997	0.09943
25	Comprehensibility	0.27491	-0.07574	0.24299	0.44920	0.21477	0.38073	0.08735	-0.30858
26	Meaningfulness	0.43911	0.31188	-0.23224	0.50913	0.34731	0.36896	0.42708	-0.10845
27	Comprehensibility	0.19401	0.43366	-0.04278	0.00457	0.21309	0.36873	-0.28748	0.09483
28	Comprehensibility	0.33644	-0.22240	-0.55356	-0.04481	0.28448	-0.24587	0.39425	-0.27984
29	Meaningfulness	0.56498	0.75668	0.04323	-0.08898	0.52505	0.59003	0.37115	-0.04841
30	Manageability	0.34434	0.53468	0.25576	0.10173	0.58556	0.76240	0.00441	0.01362
31	Comprehensibility	0.54528	0.03056	-0.73528	0.03332	0.41391	0.01262	0.64260	-0.04408
32	Meaningfulness	0.27784	0.38972	0.11192	0.31654	0.64524	0.70259	0.26762	0.10845
33	Manageability	0.32442	0.52936	-0.10212	0.11870	0.17342	0.35771	0.14554	-0.19515
34	Comprehensibility	0.11886	0.25017	0.06242	0.21472	0.36260	0.46458	-0.41301	-0.19916
35	Comprehensibility	0.32217	0.14779	-0.45520	0.29082	0.65170	0.23155	0.74908	-0.14073
36	Meaningfulness	0.58998	0.69331	-0.22491	-0.21232	0.58344	0.69099	0.02740	0.22499
37	Manageability	0.69620	0.10201	-0.80123	-0.13864	0.60130	0.08520	0.74414	0.12030
38	Meaningfulness	0.34402	0.52742	0.30533	0.03821	0.36766	0.53195	-0.14046	0.21712
39	Meaningfulness	0.33672	0.40181	-0.31037	0.21460	0.50651	0.67806	-0.11102	0.14461
40	Manageability	0.53054	-0.02922	-0.72187	0.15329	0.48951	0.12284	0.67644	-0.01412
			7.54341	4.78856	2.89371		9.04971	4.50626	3.01302
Percentage of Total Variance			18.9	12.0	7.2		22.6	11.3	7.5

Correlations Among Oblique Factors

Factor I	1.00000			1.00000		
II	-0.10249	1.00000		0.10892	1.00000	
III	0.07695	0.04487	1.00000	0.16037	0.04847	1.00000

Factor analysis was repeated on the 40 item responses of the Coherence Scale posttest. The most interpretable solution remained a three factor oblique pattern rotation. However, some changes did emerge. (See Table 5 for a comparison listing of the three factors.) The three factors had an eigenvalue greater than three; totally, the three factors accounted for 41.40 per cent of the variance on the posttest.

(a) Factor I

Factor I accounted for 22.60 per cent of the total variance of the Coherence Scale. Items loading 0.400 or greater related to life being useful, of worth to expend energy in committment. Life contained "acceptable solutions". This factor was termed "meaningfulness". Items loading to 0.400 or greater are as follows:

Item

1. Physical health is largely determined by luck.
4. Goals are never reached no matter how hard one works.
19. It is reasonable having rules to guide life.
20. Having a purpose in life is worthwhile.
21. Feeling helpless can be overcome.
22. One can compensate for a lack of strength and energy.
29. Every day of one's life counts.
30. Measures can be taken to prevent illness.
32. What one does in life matters.
34. Feeling good about oneself makes sense under all circumstances.
36. Each individual has his own merit.
38. Every experience in life is useful.

39. One can learn from mistakes.

(b) Factor II

Factor II accounted for 11.30 per cent of the total variance of the Coherence Scale. Aspects of coherence described by Factor II related to life being "consistently unmanageable", or to a sense of "acceptable frustration". This factor was called "manageability". Items loading 0.400 or greater are as follows:

Item

12. Day to day life is chaotic.
14. What lies ahead is never known.
18. Information provided is seldom understandable.
23. Changing is seldom worth the effort.
24. Perserverance never makes a difference in the end.
26. Having values to live by is pointless.
31. Doing one's best is never enough.
35. Life is a guessing game.
37. Being optimistic seldom makes sense.
40. Help one receives is seldom adequate.

(c) Factor III

Factor III accounted for 7.50 per cent of the total variance of the Coherence Scale. The predominant theme occurring in Factor III related to life being consistent, of understanding the reasons why things are as they are. Life has a sense of dependability of being "consistently worthwhile". This factor was called "comprehensibility". Items loading 0.400 or greater are as follows:

Item

2. Having self-respect makes a difference in life.
5. Everyone believes in something.
6. Seeking help with problems is useful.
8. Having responsibilities in life is gratifying.
9. Relationships with others are dependable.
11. Solving problems is satisfying.
13. One cannot rely on support from others.
16. Having sexual concerns is reasonable.

The factor correlation matrix indicates a positive relationship between Factors I, II and III. (Refer to Table 5 for the correlation matrix.) The factor analysis solutions are now discussed.

The first research question (cf. Chapter I, p. 3) pertained to the degree to which selected factors emerged as predicted by Antonovsky's theory. It was determined a priori that the concept, a sense of coherence, was multidimensional. However, it would appear that one strong factor emerged. This multidimensional solution with one strong factor as verified by the high alpha coefficient achieved, perhaps indicates that a sense of coherence is in reality unidimensional with underlying components as opposed to three unique dimensions.

Secondly, another explanation may lie in measurement error. It was noted that Factor I consisted of positive items while Factor II consisted of negative items. Perhaps the factor loadings obtained are a function of the difficulty in responding to negative items.

Thirdly, perhaps the dimension of meaningfulness, Factor I, was measured "well", in comparison to the other dimensions of a sense of coherence. These three considerations in the interpretation of the factor analysis results were taken into consideration when analyzing the results of the remaining validation studies.

The items developed _a priori_ to measure the dimensions of comprehensibility, manageability and meaningfulness did not always correlate with the factor pattern emerging from the data. In addition to the above considerations, another explanation may lie in the items themselves.

The three factors of comprehensibility, manageability and meaningfulness were proposed to be theoretically related; however, in reality can one effectively operationalize these concepts as separate entities? As was demonstrated, the concepts of "order" and "control" were simultaneously used to interpret the same item and it appeared difficult for subjects to separate the concepts cognitively. There appear to be distinctions among the three dimensions but these distinctions may not be readily measurable. It is possible that items that reflect belief statements that combine the three factors would lend more validity in measuring the attitude of sense of coherence. This approach may more readily reflect possible "coherence profiles" as depicted in Figure 6, or in other words, a unidimensional concept.

Additionally, in examining the themes of the items loading under the three factors, there was often an overlap of concepts as defined _a priori_. As was verified in the reliability estimates,

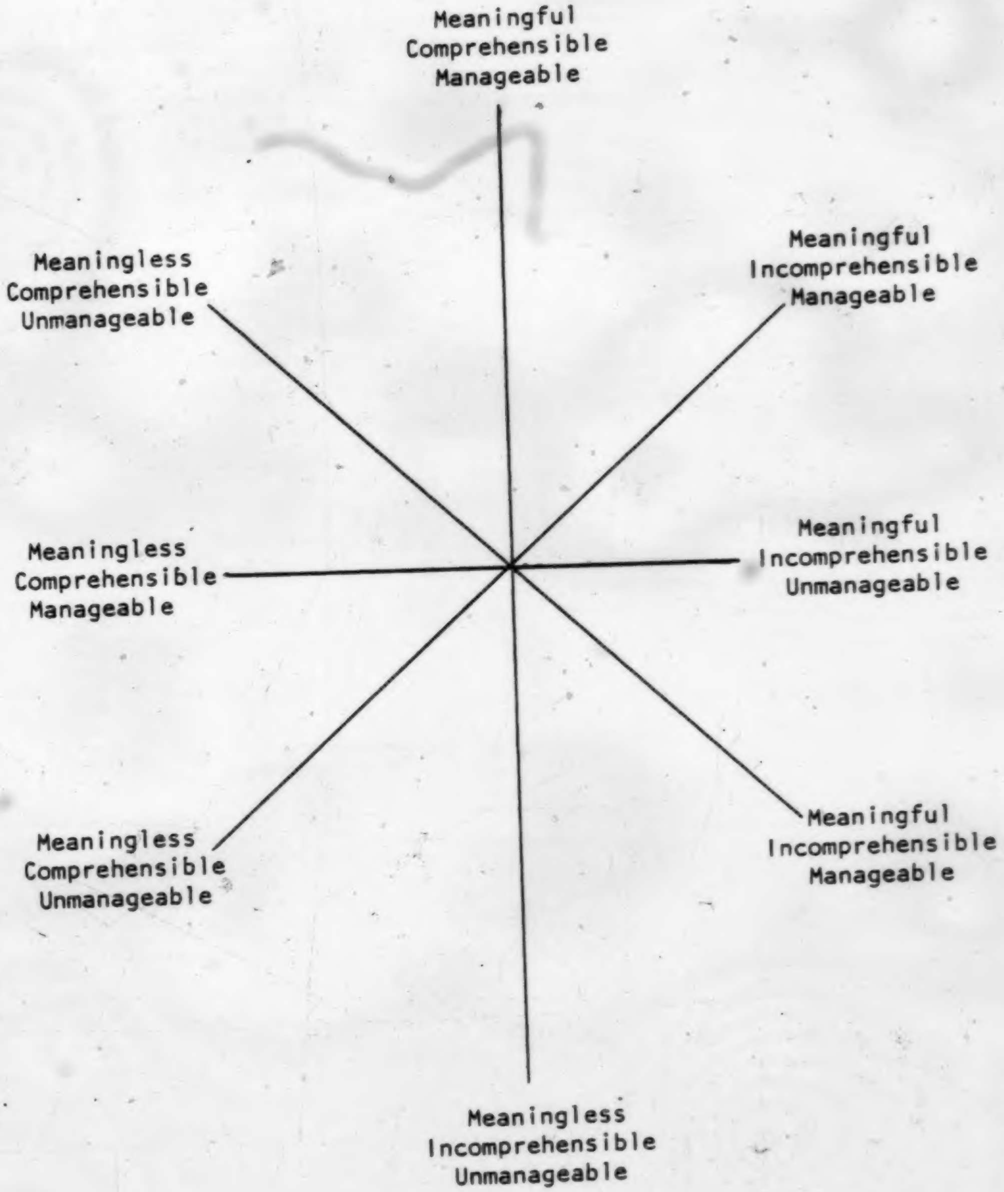

Figure 6. Coherence Profiles with Component Combinations

comprehensibility items were the most heterogeneous. The "consistency" and/or "predictability" theme could be detected in manageability or meaningfulness items as well, for example, items reflected "consistently worthless", or "inconsistently manageable". This multitrait nature of items was demonstrated when "meaningfulness" items were interpreted under the factor of comprehensibility. For example, "meaningfulness" items reflected a comprehensibility theme concomitantly in such items as "dependability is worthwhile".

Furthermore, the themes change from pretest to posttest in Factors II and III from one of "inconsistency, lack of control and futility", to one of "acceptability and understandably unpredictable". This change may have reflected the stages of adjustment that the coronary subjects were experiencing. Again, perhaps a unidimensional definition of coherence could be studied to determine coping strategies of various "coherence profiles". Additionally, in trying to account for the change in Factor II from pretest to posttest, the investigator wonders, have the subjects redefined their 'boundaries' and 'successfully given up', as the Salutogenic Model might imply?

The correlation matrix of the three factors indicated a negative relationship between Factor I, "meaningfulness" and Factor II, "powerlessness" in the pretest results. Although life was seen as "bearable and worthwhile", it was also interpreted as being "inconsistent and unpredictable". Things were possibly viewed as "happening without worthwhile solutions". In the posttest, a positive relationship existed between Factors I and II. Possibly, at this time, for those coronary subjects, life is now "acceptably unmanageable".

Health Index

The scores on the five items from the Health Index were analyzed for orthogonal and oblique principal axis factor solutions. An oblique pattern rotation yielded a one factor solution accounting for 57.50 per cent of the variance. The five items correlated 0.70187, 0.77210, 0.76881, 0.70440 and 0.83721 with the principal factor. Each of the five themes emerging were interpreted according to Antonovsky's four facets of health and the investigator's item on self-rating of health status. (See Table 6 for the factor matrix.) The factor solution proposed a priori in accordance with the Salutogenic Model of Health was the emergence of five dimensions inherent in the concept "health". As suggested by the alpha coefficient achieved in this study for the Health Index, the concept is perhaps unidimensional with underlying components; namely, pain, functional limitations, prognostic implications, action potential and perception of health status, rather than a multidimensional space.

Establishment of Construct Validity: T-test

To establish a degree of construct validity, the extent to which the construct proposed by the Salutogenic Model, "a sense of coherence", accounted for the variance in test performance was examined. It was hypothesized that health status as reflected in one's sense of coherence changes over time in response to a stressor. The stressor was defined as a myocardial infarction or coronary bypass surgery for this subject group. A t-test was carried out to determine if there were any significant differences between the pretest and posttest coherence scores. The mean score for a sense of coherence decreased from 193.10 to 192.190 over the eight week test period; however, not to a statisti-

Table 6. Health Index Major Variables: Oblique Primary Factor Matrix

Item Number	Variable Description	Communality	Factors I	II	III	IV	V
1	Pain	1.00000	0.70187	0.60359	0.26594	-0.08007	0.25676
2	Functional Limitations	1.00000	0.77210	0.12400	-0.42376	0.45512	-0.04214
3	Prognostic Implications	1.00000	0.76881	-0.37663	-0.28973	-0.29395	0.31101
4	Action Potential	1.00000	0.70440	-0.41089	0.52674	0.23988	-0.00058
5	Self-rating of Health	1.00000	0.83721	0.07119	-0.00926	-0.28449	-0.46151
			2.87693	0.69544	0.61178	0.43842	0.37742
	Percentage of Total Variance		57.5	13.9	12.2	8.8	7.5

Correlation Among Oblique Factors

Factor					
I	1.00000				
II	0.33874	1.00000			
III	0.47309	0.36721	1.00000		
IV	0.52291	0.45693	0.37902	1.00000	
V	-0.55972	-0.53249	-0.48770	-0.54924	1.00000

cally significant degree (t=0.68, with 41df, p=0.500). Additionally, there was no determined difference between the pretest and posttest scores on the individual factors of comprehensibility, manageability or meaningfulness.

When the directional differences were examined descriptively, very little change was noted. The mean scores for a sense of coherence and the subscale comprehensibility decreased by only one point. The mean score for the subscales of meaningfulness remained the same, while manageability improved by one point.

However, as measured by the Health Index, there was an improvement noted in the health scores of the subjects. The mean score on the Health Index pretest was 14.381 and 12.524 on the posttest (t=2.58, with 41df, p=0.013). This lowered score indicates less "breakdown" or "improvement" in the subjects' perception of their health. The total work performed by subjects on the exercise bicycle improved from a mean of 3419.512 kpm to 5215.853 kpm (t=-5.51, with 40df, p=0.000). The heart rate of subjects increased from a mean of 116.585 beats/minute to 131.342 beats/minute (t=-5.01, with 40df, p=0.000). The mean maximum myocardial oxygen consumption (as measured by double product) increased from 18,844 to 22,350 (t=-4.64, with 40df, p=0.000) with subjects being able to perform more work with an increased heart rate and oxygen consumption before experiencing angina, dyspnea, fatigue or arrythmias, in short, before being limited by their coronary artery disease. (Refer to Table 7 for complete t-test results.)

As an improvement in a sense of coherence as measured by the Health Coherence Attitude Scale was not detected between the pretest and posttest although an improvement in the health status of subjects

Table 7. T-test Results of Pretest-Posttest Scores

Variable	Number of Cases	Mean	Standard Deviation	Standard Error	(Difference) Mean	Standard Deviation	Standard Error	T Value	Degrees of Freedom	2-Tail Prob.
Coherence Scale										
Pretest	42	193.3095	19.427	2.998	1.1190	10.652	1.644	0.58	41	0.500
Posttest		192.1905	19.336	2.984						
Health Index										
Pretest	42	14.3810	4.173	0.644	1.8571	4.657	0.719	2.58	41	0.013*
Posttest		12.5238	3.717	0.574						
Comprehensibility										
Pretest	42	54.4286	8.713	1.344	0.9762	5.854	0.903	1.08	41	0.286
Posttest		53.4524	7.082	1.093						
Manageability										
Pretest	42	62.9762	8.368	1.291	-0.2857	4.855	0.749	-0.38	41	0.705
Posttest		63.2619	8.015	1.237						
Meaningfulness										
Pretest	42	75.9048	6.116	0.944	0.4286	5.473	0.845	0.51	41	0.615
Posttest		75.4762	7.286	1.124						
Work (kpm)										
Pretest	41	3419.5122	1949.131	304.403	-1796.3415	2088.432	326.158	-5.51	40	0.000*
Posttest		5215.8537	2895.739	452.235						
Heart Rate (Beats/min)										
Pretest	41	116.5854	21.257	3.320	-14.7561	18.865	2.946	-5.01	40	0.000*
Posttest		131.3415	23.255	3.632						
Double Product (max H.R.x max S.B.P.)										
Pretest	41	18.8444	5.254	0.821	-3.5056	4.834	0.755	-4.64	40	0.000*
Posttest		22.3500	6.112	0.955						
Pain										
Pretest	41	0.3902	0.494	0.077	0.1707	0.587	0.092	1.86	40	0.070
Posttest		0.2195	0.419	0.065						
Fatigue										
Pretest	41	0.4390	0.502	0.078	0.1220	0.600	0.094	1.30	40	0.200
Posttest		0.3171	0.471	0.074						
Arrhythmias										
Pretest	41	0.1707	0.381	0.059	-0.0732	0.412	0.064	-1.14	40	0.262
Posttest		0.2439	0.435	0.068						
Dyspnea										
Pretest	41	0.1463	0.358	0.056	-0.0244	0.474	0.074	-0.33	40	0.743
Posttest		0.1707	0.381	0.059						

*indicates significant at 0.05 level.

was, the raw scores for each individual were assessed to determine if any pattern or profile was evident. For the majority of subjects, very little variation in scores between pretest and posttest was noted. (See Table 8 for individual raw scores of the subjects.) This was also reflected in the responses to most individual items (i.e., little change in response to items between pretest and posttest was seen. (See Table 9.) These findings appeared to support the t-test results (both inferentially and descriptively) that no change in a sense of coherence as measured in this study occurred.

As the t-test results did not verify the hypothesis that coherence changes over time in response to a stressor, the investigator questioned her a priori assumption on the direction of change expected. Perhaps it is not that one moves on the continuum from "coherence" to "non-coherence" in response to a stressor, but that one's "coherence profile" may change, which may not necessitate an overall significant change in a coherence score, as measured in this study. As a "coherence profile" per se was not measured and the items established to measure each factor were not "pure", this possibility could not be tested using this particular attitude scale.

Another possible explanation for why no large directional or inferential change occurred, if there was one, in the construct measured, may lie in the probability statements developed. Perhaps the conceptualization of coherence as "prevailing over time" was operationalized incorrectly by the investigator. The items reflected "can be" statements, rather than "at present". Therefore, even if life seemed chaotic "now", whay may have been measured was the subject's sense that life "can be" orderly in the future. To achieve a measure-

Table 8. Individual Summed Scores on Health Coherence Attitude Scale

Subject	COHERENCE		HEALTH INDEX		COMPREHENSIBILITY		MANAGEABILITY		MEANINGFULNESS	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
1	190	193	3	9	44	47	64	62	82	84
2	210	199	19	18	56	59	72	62	82	78
3	204	196	15	14	57	57	68	60	79	79
4	206	214	14	17	64	62	69	72	73	80
5	200	192	11	9	56	55	69	66	75	71
6	195	200	13	13	46	58	67	68	82	74
7	195	195	10	11	58	56	67	64	70	75
8	182	165	16	14	45	38	65	60	72	67
9	197	212	9	8	54	52	64	77	79	83
10	172	174	9	11	53	45	47	53	72	76
11	173	145	12	13	52	44	54	49	67	52
12	176	187	20	14	48	46	57	62	71	79
13	187	189	10	10	47	51	58	62	82	76
14	204	198	7	12	58	47	66	67	80	84
15	224	216	12	12	68	66	73	68	83	82
16	167	173	13	17	31	44	58	59	78	70
17	156	169	21	13	40	46	49	54	67	69
18	233	229	19	7	72	69	78	77	83	83
19	201	174	21	12	62	50	62	53	77	71
20	220	216	8	11	68	61	73	74	79	81
21	176	186	14	10	45	52	58	60	73	74
22	217	189	17	10	66	53	71	69	80	67
23	197	209	15	14	55	59	62	69	80	81
24	208	210	16	6	70	58	69	70	69	82
25	150	152	15	15	48	48	46	46	56	58
26	174	165	18	9	48	51	55	51	71	63
27	187	188	13	11	52	49	60	65	75	74
28	206		12		64		60		82	
29	216	210	13	11	64	58	69	71	83	81
30	165	171	15	25	46	46	47	54	72	71
31	202	215	22	9	57	62	67	70	78	83
32	201	192	15	14	60	59	63	57	78	76
33	165	169	21	20	45	44	47	54	73	71
34	184	192	15	10	60	61	59	58	65	73
35	202		20		50		69		83	
36	178	184	16	15	51	52	55	59	72	73
37	202	203	12	8	57	57	64	65	81	81
38	202	187	17	14	58	55	68	61	76	71
39	176	178	11	10	52	54	55	55	69	69
40	203		9		62		63		78	
41	217	218	19	15	56	57	77	77	84	84
42	191	188	8	13	46	41	64	65	81	82
43	220	222	10	12	64	61	72	77	84	84
44	211	212	12	11	58	62	73	71	80	79
45	188	196	22	19	49	53	64	64	75	79

Table 9. Coherence Scale Item Frequencies

	Item	Pretest Mean	Pretest Item S.D.	Posttest Mean	Posttest Item S.D.	Diff. Item Mean	Diff. S.D.
Manageability	1	4.911	1.490	4.714	1.566	-0.2619	1.6683
Meaningfuless	2	5.644	0.883	5.524	1.153	-0.1190	0.9160
Comprehensibility	3	2.800	1.325	2.786	1.353	0.0	1.1476
Manageability	4	5.133	1.575	5.143	1.507	0.0714	1.8131
Comprehensibility	5	5.178	1.193	5.190	1.254	0.0476	1.5134
Meaningfulness	6	5.222	0.850	5.262	1.127	0.0714	1.0908
Manageability	7	4.933	1.031	5.000	0.988	0.0952	0.7590
Meaningfulness	8	5.622	0.684	5.310	0.975	-0.2857	1.0426
Comprehensibility	9	5.022	0.839	4.548	1.194	-0.4524	1.4684
Manageability	10	4.844	1.296	4.905	1.246	0.0	1.1476
Meaningfulness	11	5.711	0.506	5.595	0.665	-0.0952	0.5322
Comprehensibility	12	4.022	1.712	3.881	1.596	-0.1667	1.4802
Manageability	13	4.689	1.104	4.810	0.890	0.1667	0.7624
Comprehensibility	14	2.600	1.615	2.595	1.515	-0.0238	1.5537
Meaningfulness	15	4.978	0.892	4.929	0.997	0.0	1.0121
Comprehensibility	16	3.822	1.874	3.881	1.837	0.0952	1.9977
Meaningfulness	17	5.756	0.830	5.548	0.916	-0.1905	1.2344
Manageability	18	4.022	1.588	4.333	1.408	0.3333	1.3004
Manageability	19	5.333	0.853	5.167	0.794	-0.1429	0.8991
Meaningfulness	20	5.778	0.560	5.619	0.764	-0.1667	0.6955
Manageability	21	5.378	0.777	5.357	0.821	-0.0476	0.7309
Comprehensibility	22	4.933	0.915	4.929	0.808	-0.0476	0.9094
Meaningfulness	23	4.644	1.583	4.857	1.354	0.2619	1.7951
Manageability	24	4.867	1.486	4.738	1.578	-0.0952	2.0578
Comprehensibility	25	4.800	1.618	4.571	1.595	-0.2381	1.7504
Meaningfulness	26	5.178	1.451	5.452	1.152	0.3333	1.4761
Comprehensibility	27	5.133	1.057	4.857	1.372	-0.2619	1.5936
Comprehensibility	28	3.133	1.727	3.024	1.645	-0.0714	1.5679
Meaningfulness	29	5.711	0.626	5.667	0.650	-0.0238	0.6803
Manageability	30	5.333	1.128	5.262	0.767	-0.0476	1.1884
Comprehensibility	31	4.444	1.816	4.167	1.847	-0.2381	1.2842
Meaningfulness	32	5.422	1.033	5.548	0.772	0.1190	0.9678
Manageability	33	5.022	1.076	4.976	1.195	-0.0952	1.3217
Comprehensibility	34	4.533	1.517	4.857	1.072	0.4048	1.3445
Comprehensibility	35	4.289	1.660	4.167	1.464	-0.0238	1.2589
Meaningfulness	36	5.467	0.661	5.333	0.786	-0.0952	0.6172
Manageability	37	4.489	1.561	4.595	1.398	0.1190	0.9678
Meaningfulness	38	5.422	0.941	5.190	1.194	-0.2143	0.8126
Meaningfulness	39	5.689	0.633	5.643	0.577	-0.0238	0.4679
Manageability	40	4.089	1.730	4.262	1.499	0.1905	1.6855

ment of the "present" level of coherence, other alternative ways of scoring the Coherence Scale could be looked at, rather than the raw sum of the three factors used in this study.

To the extent that sense of coherence is a highly prevailing attitude, even a valid sense of coherence instrument may not show change in response to life events, much less over an eight week period, in a relatively homogeneous group of people (in this case, subjects with coronary heart disease). Therefore it may be more logical to expect that no change in sense of coherence would occur over an eight week period.

Establishment of Construct Validity: Pearson Correlations

Factor Scores

Pearson correlations between mean factor scores on the Coherence Scale and health measures were done for both the pretest and posttest. A significant relationship was not determined between Factors I, II and III and the Health Index or other health measures on the pretest data. Factor III, "ambiguity", did correlate significantly (0.3092) with the fourth facet of the Health Index, "action potential". However, considering the limited power of the study, directional relationships anticipated *a priori* were weakly demonstrated between mean factor scores and the health variables of the pretest.

On the posttest, Factor I, "meaningfulness", correlated (-0.2761) with the Health Index score; Factor II, "manageability", correlated (-0.3360); while Factor III, "comprehensibility", did not. Factor II, "manageability", also correlated with the double product (0.2614), with the first facet of Health Index, "pain" (-0.2960), with the third facet of the Health Index, "prognostic implications" (-0.3420) and with the fourth facet, "action potential" (-0.2664). Factor I, "meaningfulness", correlated -0.4526 with the subject's perception of self-rating of their health state. Factor III, "comprehensibility", correlated 0.3597 with "functional limitations", of the Health Index, 0.3537 with the "prognostic implications" and 0.2611 with "action potential". Factor III also correlated 0.4112 with the presence of arrhythmias during exercise testing. Refer to Table 10 for the complete set of Pearson correlation coefficients obtained between factor scores and the health measures.

In terms of factor scores, a meaningful relationship was detected between a sense of coherence and health status. On the pretest, Factor III, "ambiguity" related to the "action potential" of the Health Index. If one views life as being "inconsistent" and "pointless", the subject's perception of the need to take action for his health state would seem pointless. On the posttest, Factor I, "meaningfulness" and Factor II, "manageability" related to the summed score on the Health Index. The degree of meaningfulness and manageability were assumed a priori to be reflected in health status. As life became more controllable, life became more valuable. "Manageability", Factor II, also related to the "action potential, prognostic implications and pain facets" of the Health Index. It would seem that as subjects found life "under control" there was "less pain, less need for medical intervention and less acuity perceived" with respect to their health state.

Factor I, "meaningfulness" was found to relate to the self-rating by subjects of their health state. The more "acceptable solutions" life is felt to offer, together with the degree of "commitment to living" perceived by subjects, the higher subjects rated them-

Table 10. Pearson Correlation Coefficients with Factor Scores

Pretest	Pain Index	Functional Limitations	Prognostic Implications	Action Potential	Self-rating	Health Index Sum
Factor Score 1	-0.2218 P=0.072	-0.1288 P=0.200	-0.1529 P=0.158	0.1696 P=0.133	-0.2202 P=0.073	-0.1578 P=0.150
Factor Score 2	-0.0395 P=0.398	-0.2364 P=0.059	0.0270 P=0.430	-0.0755 P=0.311	0.0625 P=0.342	-0.0395 P=0.398
Factor Score 3	-0.0503 P=0.371	-0.0719 P=0.319	-0.2551 P=0.045	-0.3092 P=0.019*	-0.1297 P=0.198	-0.2267 P=0.067
Posttest						
Factor Score 1	-0.2147 P=0.086	-0.1614 P=0.154	0.0353 P=0.412	-0.1239 P=0.217	-0.4526 P=0.001*	-0.2761 P=0.038*
Factor Score 2	-0.2960 P=0.029*	-0.2445 P=0.059	-0.3430 P=0.013*	-0.2664 P=0.044*	-0.1439 P=0.182	-0.3360 P=0.015*
Factor Score 3	0.0078 P=0.480	0.3597 P=0.010*	0.3537 P=0.011*	0.2611 P=0.047*	0.0209 P=0.448	0.2410 P=0.062

*Indicates significant at 0.05 level.

Table 10 (Continued). Pearson Correlation Coefficients with Factor Scores

Pretest	Work (kpm)	Heart Rate	Double Product	Pain	Fatigue	Arrhythmias	Dyspnea
Factor Score 1	0.0136 P=0.465	-0.0179 P=0.453	0.1175 P=0.221	0.0947 P=0.268	-0.0815 P=0.297	0.1865 P=0.110	0.1469 P=0.168
Factor Score 2	-0.3398 P=0.011	0.0828 P=0.294	-0.0581 P=0.352	-0.0739 P=0.315	0.3746 P=0.006*	-0.0797 P=0.301	-0.1930 P=0.102
Factor Score 3	-0.0938 P=0.270	-0.1114 P=0.233	-0.0248 P=0.436	-0.1352 P=0.188	-0.0055 P=0.486	0.3071 P=0.020*	-0.1401 P=0.179
Posttest							
Factor Score 1	0.0758 P=0.319	0.0278 P=0.431	0.2106 P=0.093	0.0885 P=0.291	-0.1596 P=0.159	0.1002 P=0.267	0.0750 P=0.321
Factor Score 2	0.1971 P=0.108	0.2550 P=0.054	0.2614 P=0.049*	0.1209 P=0.226	0.0398 P=0.402	0.2426 P=0.063	-0.1762 P=0.135
Factor Score 3	0.0112 P=0.472	-0.1163 P=0.235	-0.1734 P=0.139	0.0026 P=0.494	0.0512 P=0.375	0.4112 P=0.004*	0.0424 P=0.396

*Indicates significant at 0.05 level.

selves on the optimal health ladder. On the posttest, Factor III, "comprehensibility", was found to relate to "action potential, functional limitations and prognostic implications". When life is viewed with certainty and dependability, the reasons for "functional limitations, requiring help and accepting a chronic condition" are perhaps seen as "understandable and worthwhile". In other words, there is change with order, rather than disorder or unchanging.

During the posttest interview many comments shared by subjects with the investigator tended to support the above relationships found between the Factor scores and the health measures. A few examples are given.

"I feel back to normal."

"I'm very unsure of my limitations yet."

"How much stress can I tolerate?"

"There is always uncertainty, what if it happens again?"

"At least it's a clean illness as opposed to other injuries."

"Would need to box myself in to slow down."

"I go until I feel pain."

"I spread myself too thin."

"I'm self-critical. I'm my worst enemy."

"Greatest concern is the lack of information."

"I worry too much."

"Can't sit still. Always on the go."

"I need to learn to slow down."

"I'm useless and depressed. I can't do what I want to do."

"I have a lot of inner drive and get frustrated."

"God decides, he holds the key."

"Exercise gave back my confidence."

"I was overorganized and overinvolved."

"Constantly analyzing yesterday."

"Maybe I set my goals too high."

"Although my exercise tolerance has improved, I'm concerned with how much stress I can stand."

"I enjoy a hectic life."

"Goal is to participate again."

"Learning to live today."

"There is always demands and frustrations."

"Live a crazy lifestyle."

Generally, a sense of being overwhelmed and confused, leading to depression and anger, was experienced by subjects. This finding is reported in the literature as stages of adapting to a myocardial infarction. It appears to parallel the interpretation adopted for Factors I, II and III. Is this a response profile to stress, a coping strategy? Or is this a coherence profile accounting for the health state and hence the coping response? As was discussed above, if the latter is true, a change in coherence as measured in this study would not be detected. Perhaps intervention to change the "coherence profile" is necessary before a measurable change in coherence will occur to be detected.

Residual Scores

According to Antonovsky's theory, one's sense of coherence level is related to one's level of health. Based on the conceptual framework, it was hypothesized that criterion measures of health would correlate with the predictor, sense of coherence. To investigate construct validity, residual change scores were calculated for coherence and correlated with residual change scores for the measurements of health.

The residual Coherence Scale score was found to be only weakly related to the residual Health Index score (r=0.0157, with 42df, p=0.461). Additionally, no significant relationship was detected with the residual subscale scores of comprehensibility (r=0.0669, with 42 df, p=0.337), manageability (r=0.0183, with 42df, p=0.454) and meaningfulness (r=0.1415, with 42df, p=0.186). The only relationship between the three proposed a priori factors of coherence was between the residual score in manageability and the residual score in meaningfulness (r=0.4788, with 42df, p=0.001). This finding tended to collaborate with the previous discussion of factor analysis results (i.e., multidimensional vs. unidimensional solution) and relates to the second research question (cf. Chapter 1, p. 3). Does this support a one factor solution or a multidimensional solution with measurement error? Whether a sense of coherence is operationally defined as a multidimensional space (i.e., three unique factors) or a multidimensional continuum (i.e., unidimensional space with three underlying components has important implications for the subsequent measurement of the concept and in turn its relationship to health.

Although a conclusive relationship was not established between a sense of coherence as measured in this study and the health variables as measured in this study, inter-correlations among the health variables were noted. The residual change in the Health Index score decreased (lower breakdown scores are equatable with improved health) as the residual change in the heart rate increased (r=-0.4740, with 41df, p=0.001) and the double product (estimate of myocardial oxygen uptake) increased (r=-0.4044, with 41df, p=0.004). As the amount of work performed on the bicycle increased, the myocardial oxygen consumption (double product) increased (r=0.3588, with 41df, p=0.011), as did the heart rate (r=0.3403, with 41df, p=0.015). It was also noted, that as the heart rate increased, so did the myocardial oxygen consumption (r=0.8314, with 41df, p=0.000). See Table 11 for a complete illustration of Pearson correlation coefficients.

Since heart rate and body oxygen intake have a linear relationship at submaximal levels of effort, the relationship between oxygen intake and heart rate can be applied to physical fitness. Improved fitness was noted by the increased myocardial oxygen uptake at increasing workloads. Thus as a subject "improved" more work was required to achieve the same heart rate.

The origins of health are considered to be found in a sense of coherence. Research question three (cf. Chapter I, p. 4), pertained to this proposed linkage. No empirical relationship was noted between the change in a sense of coherence and a change in health status as measured in this study. However, the power of the study was not sufficient to conclusively reject a false null hypothesis. Therefore, when the results are examined descriptively, a "shift" in a sense of coherence could be seen in relation to a change in health status as predicted.

It was anticipated that the premorbid level of a sense of coherence may relate to the health status of the subjects, and hence account for the subjects' adaptation post myocardial infarction. It was also proposed that subjects with a "strong coherence" adapt better

Table 11. Pearson Correlation Coefficients with Residual Scores

	Residual Coherence Score	Residual Health Score	Residual Work Score	Residual Heart Rate Score	Residual Double Product Score	Residual Pain Score	Residual Fatigue Score	Residual Arrythmia Score	Residual Dyspnea Score	Residual Comprehensibility Score	Residual Manageability Score	Residual Meaningfulness Score
Residual Coherence Score	1.0000 P=*****	-0.0157 P=0.461	0.0176 P=0.457	-0.1063 P=0.254	-0.1409 P=0.190	-0.0464 P=0.387	-0.0799 P=0.310	0.1860 P=0.122	0.1193 P=0.229	0.5756 P=0.000	0.7433 P=0.000	0.7407 P=0.000
Residual Health Score	-0.0157 P=0.461	1.0000 P=*****	0.1079 P=0.251	-0.4740 P=0.001*	-0.4044 P=0.004*	0.2079 P=0.096	0.2076 P=0.096	0.0416 P=0.398	0.2860 P=0.035*	-0.0669 P=0.337	-0.0183 P=0.454	-0.1415 P=0.186
Residual Work Score	0.0176 P=0.457	0.1079 P=0.251	1.0000 P=****	0.3403 P=0.015*	0.3588 P=0.011*	-0.1150 P=0.237	0.2149 P=0.089	-0.3956 P=0.005*	0.2221 P=0.081	0.0796 P=0.310	-0.0861 P=0.296	-0.0428 P=0.395
Residual Heart Rate Score	-0.1063 P=0.254	-0.4740 P=0.001*	0.3403 P=0.015*	1.0000 P=*****	0.8314 P=0.000*	-0.0014 P=0.497	-0.2001 P=0.105	-0.0305 P=0.425	0.0605 P=0.354	0.0909 P=0.286	-0.0528 P=0.371	-0.1225 P=0.223
Residual Double Product Score	-0.1409 P=0.190	-0.4044 P=0.004*	0.3588 P=0.011*	0.8314 P=0.000*	1.0000 P=*****	-0.0507 P=0.376	-0.1550 P=0.167	0.0138 P=0.466	-0.0324 P=0.420	-0.1020 P=0.263	-0.0072 P=0.482	-0.0515 P=0.374
Residual Pain Score	-0.0464 P=0.387	0.2079 P=0.096	-0.1150 P=0.237	-0.0014 P=0.497	-0.0507 P=0.376	1.0000 P=*****	-0.1115 P=0.244	-0.1173 P=0.233	-0.0961 P=0.275	-0.0594 P=0.356	0.0329 P=0.419	-0.0788 P=0.312
Residual Fatigue Score	-0.0799 P=0.310	0.2076 P=0.096	0.2149 P=0.089	-0.2001 P=0.105	-0.1550 P=0.167	-0.1115 P=0.244	1.0000 P=*****	-0.1246 P=0.219	0.1463 P=0.181	-0.0489 P=0.381	-0.0344	-0.0486
Residual Arrythmia Score	0.1860 P=0.122	0.0416 P=0.398	-0.3956 P=0.005*	-0.0305 P=0.425	0.0138 P=0.466	-0.1173 P=0.233	-0.1246 P=0.219	1.0000 P=*****	-0.0903 P=0.287	0.0732 P=0.325	0.1720 P=0.141	0.2791 P=0.039*
Residual Dyspnea Score	0.1193 P=0.229	0.2860 P=0.035*	0.2221 P=0.081	0.0605 P=0.354	-0.0324 P=0.420	-0.0961 P=0.275	0.1463 P=0.181	-0.0903 P=0.287	1.0000 P=*****	0.1408 P=0.190	0.0435 P=0.394	-0.0821 P=0.305
Residual Comprehensibility Score	0.5756 P=0.000	-0.0669 P=0.337	0.0796 P=0.310	0.0909 P=0.286	-0.1020 P=0.263	-0.0594 P=0.356	-0.0489 P=0.381	0.0732 P=0.325	0.1408 P=0.190	1.0000 P=*****	0.1167 P=0.231	0.1499 P=0.172
Residual Manageability Score	0.7433 P=0.000*	-0.0183 P=0.454	-0.0861 P=0.296	-0.0528 P=0.371	-0.0072 P=0.482	0.0329 P=0.419	-0.0344 P=0.415	0.1720 P=0.141	0.0435 P=0.394	0.1167 P=0.231	P=*****	0.4788 P=0.001*
Residual Meaningfulness Score	0.7407 P=0.000*	-0.1415 P=0.186	-0.0428 P=0.395	-0.1225 P=0.223	-0.0515 P=0.374	-0.0788 P=0.312	-0.0486 P=0.381	0.2791 P=0.039*	-0.0821 P=0.305	0.1499 P=0.172	0.4788 P=0.001*	1.0000 P=*****

*Indicates significance at 0.05 level.

than subjects with "low coherence". In adapting, one restores comprehensibility, manageability and meaningfulness to life. A possible hypothesis was that exercise demands more than a routine energy response. Therefore exercise fosters the capacity to call up resources and enrich one's repertoire. Exercise was assumed to have a salutary effect on tension. There was descriptive evidence found to support this (although not inferential). As outlined, the "health" of the subjects was found to improve, with a corresponding relationship to a sense of coherence seen for these subjects. It was demonstrated that the exercise performance of the subjects improved during the eight week test period. At a higher workload, the subjects, in all three groups, were able to respond with an increase in heart rate, work performed and myocardial oxygen consumption. However inferentially, improvement in a sense of coherence was not demonstrated.

It was demonstrated that as the subjects' perception of their health state improved as measured by the Health Index, so did their cardiovascular fitness. With increasing workloads, the subjects were able to respond with improved heart rates and myocardial oxygen uptake.

Establishment of Construct Validity: Mean Differences

A one-way analysis of variance was done to determine if any mean differences existed between the three groups of subjects and the residual scores. Differences were found between the mean residual score in heart rate for Group I, Group II and Group III. The surgical subjects (Group II) had higher heart rates than did the recent myocardial infarction subjects (Group I) and the exercise training subjects (Group III). Additionally, the surgical subjects (Group II) had a higher residual score in the double product (max BP x max HR). No differences in the residual change score for sense of coherence, the Health Index or other health variables were found amongst the groups. The results of the analysis of variance are presented in Table 12.

To further investigate the question of meaningful relationships between diagnostic groups, subjects were divided into two groups. Group A (n=23) consisted of subjects who were considered to be weakest in the variables under study or who were classified as "no improvement" by a subjective evaluation of the investigator during the posttest interview. Group B (n=22) consisted of those subjects who were considered to be strongest in the variables under study or who showed "improvement". If the Coherence Scale is a valid indicator of the evaluator's judgement of this concept, it should distinguish between these two groups. A two-way repeated measures analysis of variance was performed.

No differential effects were statistically significant between groups or between pretest and posttest coherence scores. Additionally, no statistically significant mean differences were found between groups on each of the three factors of coherence. In that power was so inadequate (i.e., power in fact was only 0.73), this was not an unlikely event unless the effect was considerably greater than "large" (Cohen, 1977, p. 36). However, Group A (no improvement) had a mean pretest coherence score of 191.952 and a mean posttest score of 189.095; whereas, Group B (improvement) had a mean pretest score of 194.667 and a mean posttest score of 195.286.

Table 12. Oneway Analysis of Variance Results

VARIABLE - Residual Coherence Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	0.9802	0.4901	2	0.490	0.6164
	Within Groups	39.0197	1.0005	39		

VARIABLE - Residual Comprehensibility Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	0.6124	0.3062	2	0.303	0.7402
	Within Groups	39.3875	1.0099	39		

VARIABLE - Residual Manageability Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	0.3251	0.1626	2	0.160	0.8529
	Within Groups	39.6748	1.0173	39		

VARIABLE - Residual Meaningfulness Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	0.5747	0.2874	2	0.284	0.7541
	Within Groups	39.4251	1.0109	39		

VARIABLE - Residual Health Index Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	2.3580	1.1790	2	1.222	0.3058
	Within Groups	37.6419	0.9652	39		

VARIABLE - Residual Work (kpm) Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	4.7722	2.3861	2	2.649	0.0837
	Within Groups	34.2277	0.9007	38		

Table 12 (Continued). Oneway Analysis of Variance Results

VARIABLE - Residual Heart Rate Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	9.6609	4.8304	2	6.256	0.0045*
	Within Groups	29.3391	0.7721	38		

VARIABLE - Residual Double Product Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	6.9417	3.4709	2	4.114	0.0241*
	Within Groups	32.0582	0.8436	38		

VARIABLE - Residual Fatigue Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	0.5688	0.2844	2	0.281	0.7564
	Within Groups	38.4312	1.0113	38		

VARIABLE - Residual Arrhythmia Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	1.9037	0.9519	2	0.975	0.3864
	Within Groups	37.0962	0.9762			

VARIABLE - Residual Pain Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	2.0092	1.0046	2	1.032	0.3661
	Within Groups	36.9907	0.9734	38		

VARIABLE - Residual Dyspnea Score

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups I,II,III	Between Groups	1.5257	0.7629	2	0.774	0.4685
	Within Groups	37.4743	0.9862	38		

* Indicates significant at 0.05 level.

Thus these directional findings supported the investigator's subjective classification of subjects. The three factors proposed a priori had a similar directional mean difference between groups on the pretest and posttest with the lowest score being in "comprehensibility" and the highest being in "meaningfulness".

The analysis of the health data did indicate that Group A had a higher "breakdown" score (poor Health Index rating) on the pretest and posttest than did Group B. Group A's mean health score was 15.810 on the pretest and Group B's was 12.952 (f=7.969, with 40df, p=0.000) with an improvement in both groups on the posttest to 13.667 and 11.381 respectively (f=6.542, with 40df, p=0.014). A significant interaction effect was found between groups and pretest, posttest performance on work done on the exercise bicycle (f=6.218, with 39df, p=0.017). However, as a significant interaction occurred, one cannot predict the work done based on the group alone or when the test was done. In terms of work performed, it was demonstrated that it could increase in the posttest for both groups. Both groups could have no difference in the amount of work performed. There was no statistically established difference found between Group A and B and their heart rates. However, heart rate was found to increase for both groups on the posttest. With both groups, the estimated VO_2 max. (double product) increased on the posttest with no difference detected between the groups. Table 13 outlines the results of the analysis of variance.

Perhaps the coherence scores obtained are reflective of a "coronary personality". There was no control group of "healthy"

Table 13. Analysis of Variance Results of Group A and Group B on Pretest - Posttest Scores

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	417.375	417.375	1	0.595	0.445
	Within	28055.000	701.375	40		
Coherence Pretest Posttest	Between	27.563	27.563	1	0.486	0.490
	Interaction	61.688	61.688	1	1.087	0.303
	Within	2269.000	56.725	40		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	24.117	24.117	1	0.217	0.644
	Within	4442.188	111.055	40		
Comprehensibility Pretest Posttest	Between	20.016	20.016	1	1.140	0.292
	Interaction	0.0	0.0	1	0.0	0.999
	Within	702.438	17.561	40		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	80.063	80.063	1	0.648	0.426
	Within	4941.813	123.545	40		
Manageability Pretest Posttest	Between	1.723	1.723	1	0.145	0.705
	Interaction	9.352	9.352	1	0.789	0.380
	Within	473.938	11.848	40		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	42.820	42.820	1	0.561	0.458
	Within	3053.188	76.330	40		
Meaningfulness Pretest Posttest	Between	3.855	3.855	1	0.261	0.612
	Interaction	23.051	23.051	1	1.560	0.219
	Within	591.063	14.777	40		

Table 13 (Continued). Analysis of Variance Results of Group A and Group B on Pretest - Posttest Scores

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	138.853	138.853	1	7.969	0.007*
	Within	696.957	17.424	40		
Health Index Pretest Posttest	Between	72.428	72.428	1	6.542	0.014*
	Interaction	1.718	1.718	1	0.155	0.696
	Within	442.855	11.071	40		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	32131104.00	32131104.00	1	3.405	0.073
	Within	368012288.00	9436212.00	39		
Work (kpm) Pretest Posttest	Between	64744416.00	64744416.00	1	33.562	0.001*
	Interaction	11995693.00	11995693.00	1	6.218	0.017*
	Within	75234560.00	1929091.00	39		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	364.859	364.859	1	0.442	0.510
	Within	32223.000	826.231	39		
Heart Rate (beats/min) Pretest Posttest	Between	4426.484	4426.484	1	24.644	0.001*
	Interaction	113.083	113.083	1	0.630	0.432
	Within	7005.000	179.615	39		

Factor	Source	Sum of Squares	Mean Square	DF	F	P
Groups A and B	Between	4.177	4.177	1	0.077	0.783
	Within	2127.102	54.541	39		
Double Product (max H.R.x max S.B.P.) Pretest Posttest	Between	249.180	249.180	1	21.315	0.001*
	Interaction	11.319	11.319	1	0.968	0.331
	Within	455.918	11.690	39		

*Indicates significant at 0.05 level.

subjects to verify a difference between groups' sense of coherence scores. With not controlling for, or measuring Generalized Resistance Resources (GRRs), the relation of personality to stress was not included in this study. Sense of coherence is a crucial element in one's personality structure, the picture of one's world, as opposed to ego identity, the picture of oneself. The relationship of "Type A" personality behavior and a sense of coherence could be investigated in further studies. It was interesting to note the themes which emerged in Factors I, II and III when grouped into a profile. Subjects may portray an attitude towards life that is "consistently unmanageable" yet "worthwhile and bearable". Is this suggestive of the competitive striving for control against insurmountable odds exhibited in the coronary prone personality?

Establishment of Predictive Validity: Stepwise Multiple Regression

To investigate the predictive ability of sense of coherence with the criterion measure of health, a stepwise multiple regression was carried out. Demographic and risk factor variables, along with the predictor a sense of coherence, were each added in a stepwise fashion to determine which predictor variables account for the most variance between the actual and predicted values of health status. To summarize, the inclusion of the residual change score in coherence did not prove to be a significant variable in predicting health as measured by the Health Coherence Attitude Scale. Addition of the coherence factor did not improve the relationship between health and demographic risk factors.

With the criterion variable (residual health index score), the independent variable (complications associated with health state) correlated 0.43761, accounting for 19 per cent of the variance. The multiple correlation with the additional independent variable of previous myocardial infarctions was 0.528, accounting for 27 per cent of the variance. The inclusion of these two variables in turn in the regression equation was significant at 0.05 probability.

With the criterion variable (residual change in work performed) the independent variable (stress) correlated 0.496, accounting for 24 per cent of the variance. No other independent variable was statistically significant for inclusion in the regression equation.

Previous myocardial infarctions with the additional variable of complications associated with health state, correlated with the dependent variable (residual score in double product) 0.35469 and 0.46184 in turn. The inclusion of these two variables in turn in the regression equation was significant, accounting for 21 per cent of the variance. Lastly, stress and additional health problems were significant predictors of the dependent variable pain experienced during exercise. Stress, along with additional health problems, correlated 0.35082 and 0.47569, accounting for 22 per cent. See Table 14 for a complete outline of the stepwise multiple regression results.

The residual coherence score did not prove to be a significant predictor of the criterion variable of health. However, the following predictors of health status as measured were detected. Subjects experiencing "complications associated with their health

Table 14. Stepwise Multiple Regression Results

DEPENDENT VARIABLE - Residual Health Index Score

Variable Entered	Multiple R	Standard Error	DF	F	P **
Complications with Health State	0.43761	0.76051	F1,39	9.23780	0.0042*
Previous Myocardial Infarction	0.52795	0.72771	F1,38 F2,38	4.595* 7.34228	0.0020*
Additional Health Problem	0.56947	0.71380	F1,37 F3,37	2.495 5.91921	0.0021*
Current Smoking Status	0.60142	0.70333	F1,36 F4,36	2.110 5.10021	0.0023*
Exercise Habits	0.61423	0.70455	F1,35 F5,35	0.375 4.24109	0.0041*
Current Employment Status	0.62828	0.70475	F1,34 F6,34	0.981 3.69573	0.0062*
Residual Coherence Score	0.64120	0.70559	F1,33 F7,33	0.919 3.29140	0.0091*
Social Support Status	0.65210	0.70790	F1,32 F8,32	0.785 2.95929	0.0135*
Stress Defined	0.65625	0.71582	F1,31 F9,31	0.296 2.60544	0.0228*
Body Weight for Height	0.66432	0.72081	F1,30 F10,30	0.572 2.36977	0.0331*
Occupation	0.66755	0.73030	F1,29 F11,29	0.225 2.11920	0.0520
Age	0.67139	0.73978	F1,28 F12,28	0.262 1.91496	0.0768
Prescribed Medications	0.67494	0.75007	F1,27 F13,27	0.237 1.73776	0.1095
Physical Activity	0.67897	0.76051	F1,26 F14,26	0.264 1.58844	0.1491
Family History	0.68167	0.77293	F1,25 F15,24	0.171 1.44671	0.2010

*Indicates significance at 0.05 level.
**P(for variable entered).

Table 14 (Continued). Stepwise Multiple Regression Results

DEPENDENT VARIABLE - Residual Work (kpm) Score

Variable Entered	Multiple R	Standard Error	DF	F	P **
Stress Defined	0.49640	0.86809	F1,39	12.75250	0.0010*
Prescribed Medications	0.54644	0.84845	F1,38 F2,38	2.827 8.08860	0.0012*
Exercise Habits	0.57858	0.83738	F1,37 F3,37	2.011 6.20630	0.0016*
Body Weight For Height	0.63485	0.80419	F1,36 F4,36	4.117* 6.07615	0.0008*
Age	0.67622	0.77763	F1,35 F5,35	3.498 5.89795	0.0005*
Current Employment Status	0.69661	0.76840	F1,34 F6,34	1.849 5.34223	0.0006*
Physical Activity	0.71633	0.75854	F1,33 F7,33	1.889 4.96867	0.0006*
Marital Status	0.72419	0.76129	F1,32 F8,32	0.762 4.41141	0.0011*
Previous Myocardial Infarction	0.73092	0.76548	F1,31 F9,31	0.651 3.95091	0.0020*
Family History	0.73764	0.76984	F1,30 F10,30	0.650 3.58059	0.0032*
Additional Health Problems	0.74149	0.77810	F1,29 F11,29	0.366 3.21964	0.0057*
Residual Coherence	0.74447	0.78796	F1,28 F12,28	0.278 2.90111	0.0099*
Complications with	0.74599	0.80038	F1,27 F13,27	0.138 2.60616	0.0173*
Occupation	0.74703	0.81420	F1,26 F14,26	0.091 2.34499	0.0291*
Current Smoking	0.74774	0.82932	F1,25 F15,25	0.061 2.11367	0.0474*

*Indicates significance at 0.05 level.
**P(for variable entered).

Table 14 (Continued). Stepwise Multiple Regression Results

DEPENDENT VARIABLE - Residual Heart Rate Score

Variable Entered	Multiple R	Standard Error	DF	F	P **
Complications with Health State	0.27020	0.96280	F1,39	3.07152	0.0875
Previous Myocardial Infarction	0.33481	0.95460	F1,38 F2,38	1.673 2.39881	0.1045
Additional Health Problems	0.41603	0.93360	F1,37 F3,37	2.729 2.58150	0.0680
Physical Activity	0.44241	0.93343	F1,36 F4,36	1.014 2.19023	0.0897
Occupation	0.47805	0.92716	F1,35 F5,35	1.488 2.07364	0.0922
Current Smoking Status	0.49713	0.92929	F1,34 F6,34	0.840 1.36015	0.1167
Exercise Habits	0.51447	0.93221	F1,33 F7,33	0.787 1.69688	0.1440
Body Weight For Height	0.55560	0.91790	F1,32 F8,32	2.037 1.78611	0.1167
Stress Defined	0.60004	0.89727	F1,31 F9,31	2.488 1.93793	0.0830
Age	0.61693	0.89734	F1,30 F10,30	0.996 1.84343	0.0953
Prescribed Medications	0.62805	0.90242	F1,29 F11,29	0.663 1.71725	0.1191
Current Employment Status	0.63084	0.91573	F1,28 F12,28	0.163 1.54235	0.1674
Social Support Status	0.63347	0.92995	F1,27 F13,27	0.150 1.39204	0.2261
Family History	0.63423	0.94691	F1,26 F14,26	0.042 1.24973	0.3010
Residual Coherence Score	0.63459	0.96529	F1,25 F15,25	0.019 1.12370	0.3862

*Indicates significance at 0.05 level.
**P(for variable entered).

Table 14 (Continued). Stepwise Multiple Regression Results

DEPENDENT VARIABLE - Residual Double Product Score

Variable Entered	Multiple R	Standard Error	DF	F	P **
Previous Myocardial Infarction	0.35469	0.93499	F1,39	5.61234	0.0229*
Complications with Health State	0.46184	0.89856	F1,38 F2,38	4.226* 5.15152	0.0105*
Additional Health Problems	0.50169	0.88812	F1,37 F3,37	1.898 4.14825	0.0125*
Body Weight for Height	0.54056	0.87566	F1,36 F4,36	2.060 3.71548	0.0124*
Prescribed Medications	0.57780	0.36155	F1,35 F5,35	2.189 3.5081	0.0113*
Stress Defined	0.62519	0.83589	F1,34 F6,34	3.182 3.63607	0.0068*
Occupation	0.65046	0.82571	F1,33 F7,33	1.844 3.45748	0.0064*
Marital Status	0.66025	0.82914	F1,32 F8,32	0.728 3.09125	0.0107*
Exercise Habits	0.66851	0.83416	F1,31 F9,31	0.615 2.78313	0.0163*
Current Employment Status	0.67937	0.83666	F1,30 F10,30	0.816 2.57146	0.0222*
Current Smoking Status	0.69035	0.83899	F1,29 F11,29	0.834 2.40054	0.0291*
Physical Activity	0.69647	0.84689	F1,28 F12,28	0.461 2.19802	0.0422*
Residual Coherence Score	0.70076	0.85740	F1,27 F13,27	0.318 2.00399	0.0619
Family History	0.70281	0.87125	F1,26 F14,26	0.148 1.81269	0.0920
Age	0.70313	0.88811	F1,25 F15,25	0.022 1.62970	0.1359

*Indicates significance at 0.05 level.
**P(for variable entered).

Table 14 (Continued). Stepwise Multiple Regression Results

DEPENDENT VARIABLE - Residual Pain During Exercise Score

Variable Entered	Multiple R	Standard Error	DF	F	P**
Stress Defined	0.35082	0.93644	F1,39	5.474	0.0245*
Additional Health Problems	0.47569	0.89111	F1,38 F2,38	5.069* 5.55667	0.0076*
Age	0.50908	0.88367	F1,37 F3,37	1.642 4.31458	0.0105*
Occupation	0.53191	0.88138	F1,36 F4,36	1.193 3.55103	0.0153*
Physical Activity	0.53957	0.88875	F1,35 F5,35	0.405 2.87491	0.0281*
Body Weight For Height	0.54907	0.89512	F1,34 F6,34	0.504 2.44570	0.0450*
Social Support Status	0.55600	0.90359	F1,33 F7,33	0.366 2.10945	0.0702
Current Smoking Status	0.56086	0.91399	F1,32 F8,32	0.254 1.83573	0.1066
Current Employment Status	0.56313	0.92688	F1,31 F9,31	0.116 1.59954	0.1590
Residual Coherence Score	0.56577	0.94015	F1,30 F10,30	0.131 1.41240	0.2224
Prescribed Medications	0.56687	0.95534	F1,29 F11,29	0.053 1.24831	0.3017
Family History	0.56723	0.97196	F1,28 F12,28	0.017 1.10689	0.3927

*Indicates significance at 0.05 level.
**P(for variable entered).

state", such as angina, congestive heart failure, together with having a previous myocardial infarction, was found to account for a change in "perception of health status" as measured by the Health Index. The amount of "stress" defined by the subjects also accounted for the "work performed" on the bicycle. Previous myocardial infarctions and complications associated with their health state were found to account for a change noted in the subjects' myocardial oxygen consumption during exercise. Stress and additional health problems were found to be predictive of pain experienced during exercise.

Summary of Chapter

In this chapter, the results and interpretation of data analysis were presented. Both the pilot study and main investigation were discussed in terms of content and face validity.

The results of the validation studies as well as the high alpha coefficient obtained tend to indicate that a measured sense of coherence may in fact be unidimensional with underlying components of comprehensibility, manageability and meaningfulness. Results were discussed in terms of the limitations of the measurement instrument, *a priori* assumptions and limited power of this study. Considering the evidence presented, it is unreasonable under the circumstances to question the validity of the theory underlying the study.

A summary of the study along with recommendations for future investigation are outlined in the next chapter.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

A functional definition of health does not presently exist from which reasonable nursing goals can be established. Further, an operational definition of health would provide a common frame of reference for health professionals to integrate services they provide to individuals, groups and communities. Health has evolved not as a singular, unique definition but as a family of concepts. Construction of a health index requires selection of concepts to be measured, specification of operational definitions of these concepts, explication of the central underlying presuppositions, determination of the measures to be used and a method of combining them into a single index.

Antonovsky's Salutogenic Model of Health is concerned with understanding factors involved in movement on a health ease/dis-ease continuum, or maintenance of the current position, rather than focusing on how to reach perfect health. This approach avoids conceptualizing in terms of qualitative dichotomous states of disease and non-disease. In the Salutogenic Model, the major factor contributing to movement on the health ease/dis-ease continuum is a sense of coherence. A sense of coherence was defined for this study as "an enduring attitude reflecting the degree to which one perceives stimuli to be comprehensible, meaningful and manageable." Comprehensibility is defined as a "belief that life can be structure"; manageability as a "belief that life is 'under control'"; while meaningfulness is defined as a "belief that life is worthwhile and rewarding." The main objective in this study was to develop and investigate the validity of the Health Coherence Attitude Scale, an instrument designed to measure a "sense of coherence". The relationship of coherence to health status is complex. For purposes of this study, health was defined subjectively according to Antonovsky's four "health" facets: pain, functional limitations, prognostic implications and action potential. In an effort to obtain a valid, quantifiable measure of physical health, a cardiorespiratory fitness index based on a submaximal exercise test was utilized. Theoretically, the origins of health are judged to be found in a sense of coherence. Direct and indirect evidence was found in the literature to support a link between a sense of coherence and health status. For purposes of this study, the health status of men with coronary heart disease was measured.

Sense of Coherence Operationally Defined

To generate testable hypotheses, concepts must be operationally defined. Through testing hypotheses related to the construct of a sense of coherence, a prescriptive theory may result to guide nursing practice and enhance professional nursing outcomes. The theoretical clarification of a sense of coherence is a crucial antecedent to determining valid methods of measurement. In this study, several issues were addressed in the attempt to operationally define a sense of coherence.

A sense of coherence was conceptualized as a pervasive "attitude" which possesses cognitive and affective components. For this study, an attitude was defined according to Fishbein and Ajzen

(1975) as the feelings one holds towards the stimulus. The cognitive component was derived from the beliefs regarding the stimulus. The relationship holding between beliefs and attitudes is that of the former influencing the latter. Attitudes in turn, influence behaviors. Behaviors as such were not the focus in this study.

The difficulties in defining a sense of coherence as an attitude are numerous. The term "coherence" implies a value judgement, a subjective concept affected by indeterminable numbers of variables, an abstraction, a culturally determined concept and a relative concept. Is it realistic to expect a change in attitude in eight weeks? Beliefs based on factual information, are less resistant to change and less pervasive than attitudes. Perhaps it was more likely the case that this study should have shown "no change" in subjects' sense of coherence.

As Fishbein and Ajzen's paradigm (1975) indicates, it is the underlying belief which must be altered before a resultant change in attitudes and hence behavior would result. As Antonovsky states, "coping is a plan for behavior, not the behavior that eventually results in coping with the stress" (1979, p. 113). The factors defined as beliefs underlying a sense of coherence attitude appeared to shift during the test period, although the overall sense of coherence score did not do so to a statistically significant degree. A sense of "inconsistency, lack of control and futility" appeared to be replaced with a view that life was "acceptable, worthwhile and understandably unmanageable." This finding may have reflected the stages of adjustment the subjects were experiencing. The coping strategies may be inherent in the suggested "coherence profiles". From a phenomenological approach, characteristic behaviors of coherence profiles may be identified and subsequent beliefs and attitudes identified.

The concept of sense of coherence was operationally defined by the investigator as a multidimensional trait. Factor analysis results of this study would imply that a single construct consisting of three related components is worth exploring as well as the possible measurement errors in the multidimensional approach used here.

The suggestions proposed for item development primarily reflect the above theoretical issues related to sense of coherence conceptualized as an attitude. The definitions arrived at of the underlying dimensions of "comprehensibility", "manageability" and "meaningfulness" are abstract and ambiguous at best. With regard to the notion of a sense of coherence "prevailing over time," the merits of various alternative methods of measurement and of arriving at a coherence score, including the one used - a raw summed score - are worth exploring. Should one measure the "is now" or "can be" nature of a sense of coherence attitude? Perhaps operationalizing "coherence profiles" would reduce the measurement problems associated with weighting factors, and setting probabilities for movement along the ease/dis-ease continuum. A strong sense of coherence mobilizes resources to cope with the adaptive demands of life changes. Perhaps as with health, a definition of a sense of coherence cannot be achieved but only the behaviors identified and described. The relationship of a sense of coherence to health status as explored in this study is discussed next.

Relationship of a Sense of Coherence to Health

It is difficult to determine the relationship of a sense of coherence to health given the many different ways health is defined. Since Antonovsky's Health Index is based only on the physical realm, with 'low breakdown' considered healthy, further research is warranted to examine how or if a sense of coherence contributes to other realms of health such as the social or psychological. What relationship(s) might be found between a sense of coherence and a "positive" health definition, as opposed to the "negative" definition used in this study? Is health a multidimensional construct? The Health Index of this study was found to be suggestive of a unidimensional concept with five underlying components.

The subjects of this study were middle-aged males with coronary heart disease. Based on the evidence reviewed in the literature, the investigator proposed that in the way that one's premorbid levels of a sense of coherence (SOC) and Generalized Resistance Resources (GRRs) may be predisposing factors to coronary heart disease, one's levels of SOC and GRRs may in turn positively or negatively affect the convalescence and resultant health status. More specifically, measuring a patient's response to a myocardial infarction on the basis of conceptualizing the outcome as a disintegration and subsequent reintegration of a sense of coherence, may open the way for improved intervention. In turn, it was anticipated that the stronger the sense of coherence of individuals, the more adequately they will cope with stressors in everyday life and maintain or improve their positions on the health ease/dis-ease continuum.

A dependent (repeated measures) design was utilized in this study. The validation studies achieved a degree of face validity for the Health Coherence Attitude Scale. Based upon the limited familiarity of the content experts with the Salutogenic Model of Health, a questionable degree of content validity was established.

To investigate the validity of the construct measured, factor analytic procedures were carried out. The major factors emerging were interpreted as "meaningfulness", "manageability" and "comprehensibility". To a limited degree, the factor themes were consistent with the a priori definitions of these dimensions which are judged to be inherent in a sense of coherence. The factor solution emerging may imply a possible unidimensional construct with three underlying components; however, a multidimensional construct with the emergence of one strong factor due to measurement error was explored.

To establish if differences over time in the construct measured were meaningful, analyses of pretest and posttest scores were carried out. A directional and significant difference was found in the health status of subjects on the health variables measured. No concomitant change in a sense of coherence existed for the subjects.

It was hypothesized that if a sense of coherence improves the health status simultaneously changes. It was demonstrated that the mean factor scores were related not only to the subjective interpretation of health state as measured by the Health Index, but to actual objective, quantifiable measurements of cardiovascular function. A relationship between subject's residual scores for a sense of coherence and the residual scores of the health measures was not statistically reflected. However, considering the power of the study, this finding was not unexpected.

It was also hypothesized that subjects expected by theory or judged to have improved in health status would show the most change in a sense of coherence. The one-way analysis of variance results indicated that subjects (n=45) were similar with respect to the residual scores of the variables measured. Group II (surgical subjects) did show a higher increase in heart rate and double product (estimated VO_2 max.) than did Group I (recent myocardial infarction subjects) and Group III (exercise training subjects).

The Salutogenic Model of Health suggests that coronary rehabilitation programs could act as a specific resistance resource (SRR) to shape or re-establish, even increase a sense of coherence. Although the subjects in this study demonstrated an improvement in the health variables measured, the subjects of the exercise training program (Group III, n=13) were not found to have a greater change as anticipated _a priori_. The literature documented this proposed effect of activity programs. However, as this study was not designed to measure the training effects, the investigator raises the point in relation to the intervention program and the possible contribution to the findings. Could intervention programs be aimed at providing life experiences to strengthen generalized resistance resources (GRRs) to help individuals more adequately cope with stressors of everyday life? In turn, how might the interventions affect patient positions on the health continuum; could they be maintained or improved? What situations promote development of GRRs? What characterizes a GRR?

Through an understanding of health behaviors, in terms of the individual's attitude or value framework, insights may be gained regarding improving personal and social lives. The Salutogenic orientation of engaging in goal directed behavior to strengthen the sense of coherence should be tested in a variety of practice settings. Also, a functional health model could provide the basis for assessment and establishment of goals.

To further establish construct validity, the investigator divided the subjects into two groups on whose scores a dependent analysis of variance test was applied. Group A (no improvement noted) did have a lower health rating on the Health Index than did Group B (improvement noted), with both groups showing an improved score on the posttest. That finding was not collaborated with the Coherence Scale statistically, however descriptive differences were noted. Group A and B were initially similar in exercise capacity, yet both groups did improve their work capacity on the posttest by increasing work performed, accompanied by increases in heart rate and myocardial oxygen uptake. Therefore, a meaningful difference was determined between groups to support the relationship between a sense of coherence and health status.

Further study could be carried out to determine if a particular "coherence profile" does, in fact, lead to "breakdown", and whether a particular health state leads to movement on the sense of coherence continuum. This study may have reflected what attitude a particular health state evokes. As the Salutogenic theory implies, given the same life events, people with differing strengths of coherence can manifest different health outcomes.

By identifying behaviors resulting from a sense of coherence attitude, the phenomenological approach may result in more adequately defining "healthy behavior". What level of tension is salutary? Is there a level of coherence that can be identified as a risk factor? What effect does a sense of coherence have on other realms of well-being? Further research questions that arise are: What life experiences foster growth of a sense of coherence? What behaviors indicate a low or high sense of coherence? What interventions increase sense of coherence?

The Type A behavior pattern popularized by Friedman and Rosenman (1974), may be interpreted as a response style for coping with threats to a sense of mastery and control. The relationship of the coronary prone personality to health status was reviewed in the literature. In this study, the question was raised, what "coherence profile" does a Type A personality resemble? Was this particular coping style measured? This was postulated as a possible reason for not detecting the "shattering of coherence" in response to a myocardial infarction. What perhaps was identified is the "prevailing attitude of the coronary prone personality". Therefore, a coping response was identified as opposed to the assumptions outlined a priori, which were based on the expected reactions to a myocardial infarction found in the literature.

Finally, the residual score for coherence as measured in this study was not established as a predictor of health in improving the relationship between health and demographic risk factors. However, subjects experiencing complications associated with their health state, together with having a previous myocardial infarction were found to account for a change in perception of health status as measured by the Health Index.

Recommendations and Considerations

Based upon the results and limitations of this investigation, further research endeavors should entail consideration of the following recommendations:

1. Select an increased sample size from a more representative population to permit generalizability of findings and to ensure more statistical power in the results of statistical analysis.
2. An independent design, with controls for generalized resistance resources (GRRs) would be beneficial in looking at a range of health status in subjects and at what patterns of breakdown and coherence emerge in terms of other cultural groups' occupations, educational levels and age groups.
3. The study was not directed to assess the training effect of exercise. Generally speaking, "trained" individuals perform a given work load with a slower heart rate, a greater stroke volume and with less myocardial oxygen consumption than untrained individuals. Although the work capacity of subjects improved, a training effect was not detected in this study. Perhaps a longer follow-up would show a difference in the exercise group (Group III) as compared to Group I or II. On the other hand, it is interesting that Group III did not show a difference due

to the "effects" of the Cardiac Rehabilitation Program.

4. Despite the problems discussed in operationalizing a sense of coherence and the limited power in this study, it is important to account for the seeming lack of "change" in a sense of coherence. Is it possible to have a physiological improvement in cardiovascular status over time, without a change resulting in the "coherence attitude"? If intervention to develop the subject's "coherence attitude" had been instituted, what results would have occurred? There is also the possibility that a sense of coherence is a familial/cultural trait requiring long term intervention in order to induce or detect any measurable change. To the extent that sense of coherence is a highly enduring attitude, it could be anticipated that no changes would occur over an eight week period, much less in a homogeneous group. Still, it would seem worthwhile to explore the possibility of change in a sense of coherence even in short studies.

5. Theoretically, sense of coherence prevails over time; yet in this study items were not specifically defined with reference to time. As stated earlier, this may be another possible source of explanation for why no directional or inferential change occurred in the construct measured. Alternative ways of scoring the Coherence Scale should be developed. The method utilized in this study was to take a raw sum of the three factors to obtain an "is now" score. However, as

pointed out, this may actually constitute a scoring method to operationalize the enduring, prevailing nature of an attitude. For obtaining a "true present" score, the respondent could be asked to respond to his present attitude now and also respond to his past attitude. A residual score could then be obtained to reflect the difference between pre and post "health breakdown". Another suggestion is to have the respondent rate the relative importance of his beliefs. The importance rating could then be multiplied with the residual score or the factor sum. The suggested scoring methods are:

(1) Coherence = raw summed score

(2) Coherence = residual score

(3) Coherence = residual score x importance of subfactors

(4) Coherence = raw summed score x importance of subfactors

6. Coherence profiles per se were not operationalized in this study. It would appear that on the sense of coherence continuum, the positive end would consist of "equal portions" of comprehensibility, manageability and meaningfulness.[7] The centre of the sense of coherence continuum is representative of the "average" of each of the three components. As one moves outwards, the various "profiles" of coherence emerge; i.e., in terms of meaningfulness, comprehensibility and manageability. What causes a person to move in one direction or another?

Does a stressor alter an attitude by changing perception of life events on one or two or all of the components of a sense of coherence? As with health, coherence does not lend itself to a dichotomy of coherence and non-coherence. Is the positive end of all three components analogous to the utopian concept of "perfect health"? In sum, the operationalization of a sense of coherence as unidimensional as opposed to a multidimensional trait is the most significant suggestion for future research endeavors, as well as exploring the possibility of measurement errors related to this multidimensional approach.

Since there is evidence to indicate that the questionnaire, Health Coherence Attitude Scale, needs refinement, it is unreasonable under the circumstances to question the validity of the theory underlying the study on empirical grounds. Thus, there are no immediate implications for nursing practice and nursing education which can be derived from this study. As a next step it is proposed that: the operational definition of sense of coherence be clarified, modifications in items and scoring methods be assessed and alternate study designs be explored.

Conclusion

Future testing of the Salutogenic Model is conceivable once a valid instrument is achieved. Possible research questions which may evolve from this study are: What situations produce GRRs?

What characterizes a GRR? What level of tension is salutary? What life experiences foster growth of a sense of coherence? What factors can shift a sense of coherence? What is the level of a sense of coherence that can be identified as a risk factor? What are the behaviors promoted by the attitude of a sense of coherence? What effect does a sense of coherence have on other realms of well-being? What behaviors indicate a low or high sense of coherence? What interventions increase a sense of coherence? Is health a unidimensional concept?

Antonovsky's major contribution lies not in proposing a definition of health but in suggesting questions and explanations relating to the origins of health. By focusing away from the negative, disease end of the health continuum, Antonovsky promotes further understanding of the causal relationships amongst complex, multidimensional factors and movement toward the health-ease end of the continuum. By avoiding the pathogenic orientation, salutogenesis compels one to examine everything of importance to people, including subjective interpretations of their states of health, with the recognition that what maintains health goes beyond one dimension and that absolute health is not reality (Antonovsky, 1979, p. 36). In addition, the limitations of a preventive orientation in avoiding stressors are suggested by Antonovsky. People can fall prey to the enthusiasm of unwarranted data, arrive at action proposals without adequate knowledge and ignore the price paid if health is the only human value (Antonovsky, 1979, p. 101).

In contrast to the "holistic health" movement, Antonovsky makes the distinction between health and wellness. With health viewed as physical capacities to perform personal expectations and social role tasks, other capacities of the person to fulfill these same ends are acknowledged but delegated to other health continua of the individual. By inclusion of the subjective aspect of health, Antonovsky dispenses with the value laden problems in a definition of health. A person's health is seen as individual, in a social context and relevant to time in the past, present and future. It then follows that what may be healthy for one person may not be healthy for another individual and/or group and/or at another time.

Antonovsky further contributes to the understanding of what goal-directed health behaviors might include. Complex theories from the related disciplines of sociology, psychology and anthropology are interrelated to form a parsimonious model. Although possible sources of beliefs and attitudes are discussed from the standpoints of these disciplines, causal relationships between factors still remain to be postulated and tested to gain understanding of a set of health promotive behaviors. Through an understanding of health behaviors, in terms of the individual's value framework, insights may be gained in improving personal and social lives. With health interacting in all realms of life, the salutogenic orientation of engaging in goal-directed behavior to strengthen the sense of coherence can be generalized to a variety of practice settings in nursing as well as being useful in examining how to improve relationships between patients and health workers and the organization of health care services.

A shift in the conceptualization of health in nursing is underway. The notion of health and illness as a single continuum is gradually being questioned. Assumptions based on "traditional" paradigms of health have bound nursing curricula and practice to the negative view of health in terms of absence of disease. Further, in these models, the patient is seen as dependent, the professional as the authority, and body and mind as separate entities, the body being seen as a mechanistic machine capable of reduction and repair. Individuals' living habits are the focus for "prevention of disease" and hence a "healthy lifestyle" is viewed as the means to achieve "ideal health".

With a shift in scientific thinking, the dynamic system of the "whole person" was viewed as essential in considering the harmonic process of "wellness". Health is not viewed as a static quality, an end in itself. Health is equated with the totality of life processes to be experienced; "It is a way of living, of being, a way of growing, of becoming" (Allen, 1981, p. 153). One may learn the "health process", phenomena of "health behaviors". The notion has been raised in this study that there are perhaps there variables operating: disease, health and a sense of coherence (see Figure 7). In this view, the optimal state occurs when there is an attitude of a positive sense of coherence leading to positive health behaviors accounting for a disease free state. Or in the situation where the individual has a disease but has a positive sense of coherence attitude, that combination could lead to the acquisition and utilization of generalized resistance resources and, as a result, the individual's health behaviors are such that he can cope with the disease.

Given that coherence can be successfully measured, nurses would have the opportunity to promote the development of a sense of coherence and the possible resultant healthy behaviors. It appears that

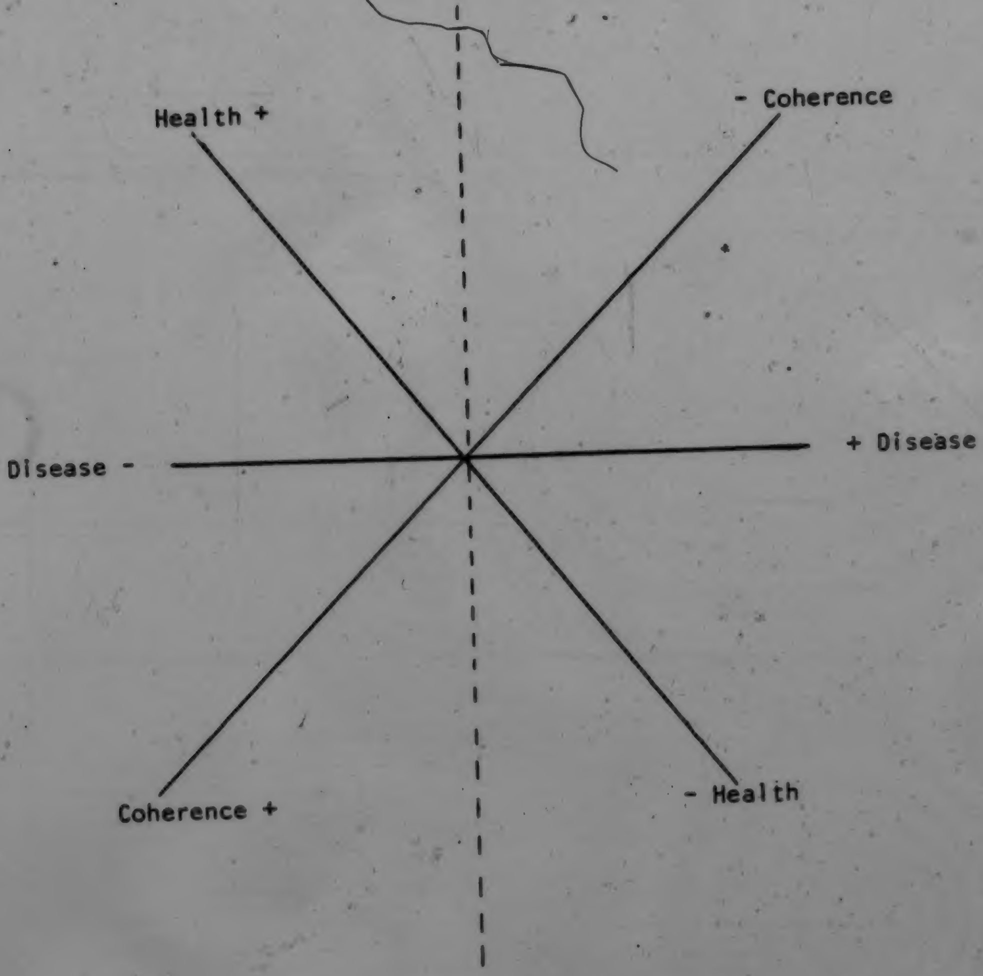

Figure 7. Health-Disease-Coherence Dimensions.

nurses could structure learning to develop Generalized Resistance Resources (GRRs) and hence a sense of coherence (SOC) with families and the individual. Interventions can be explored and planned to foster healthy living. Nursing should identify the patterns of a sense of coherence and focus on behaviors of health, the everyday life process. Health professionals can work with individuals to engage in goal-oriented behavior that promotes success within the individual's value framework. Antonovsky's contribution lies not in defining health but in suggesting explanations about the origins of health. Salutogenesis as a concept compels health researchers to examine everything of significance to people, with health interacting in all realms of life.

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APPENDIX I

QUESTIONNAIRE

HEALTH COHERENCE ATTITUDE SCALE

UNIVERSITY OF ALBERTA
FACULTY OF NURSING
CLINICAL SCIENCES BUILDING
T6G 2G3

Code No. ☐☐☐

CONFIDENTIAL DOCUMENT: not for distribution or duplication

SECTION ONE

DIRECTIONS:

This section of the questionnaire is to determine how you view your life. Each item is a belief statement with which you may agree or disagree. Beside each statement is a scale which ranges from strongly disagree (1) to strongly agree (6).

For *each* item, please circle the number that represents the extent to which you disagree or agree with the statement. The more strongly *you* agree with the statement, then the higher will be the number you circle. The more strongly *you* disagree with the statement, the lower will be the number you circle.

Circle *only one* number for each item. Be sure to answer every item.

These items are about *your* personal life; therefore, there are no right or wrong answers according to anyone but you. It is important that you respond according to how *you* view life and not according to how you believe your life should be or will be or how it has been in the past.

In My Life I Believe:	STRONGLY DISAGREE	MODERATELY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	MODERATELY AGREE	STRONGLY AGREE
1. Physical health is largely determined by luck....................	1	2	3	4	5	6
2. Having self-respect makes a difference in life..................	1	2	3	4	5	6
3. People are unpredictable..	1	2	3	4	5	6
4. Goals are never reached no matter how hard one works............	1	2	3	4	5	6
5. Everyone believes in something..................................	1	2	3	4	5	6
6. Seeking help with problems is useful...........................	1	2	3	4	5	6
7. Life's ambitions can be planned................................	1	2	3	4	5	6
8. Having responsibilities in life is gratifying...................	1	2	3	4	5	6
9. Relationships with others are dependable........................	1	2	3	4	5	6
10. It is possible to influence what happens in life...............	1	2	3	4	5	6
11. Solving problems is satisfying..................................	1	2	3	4	5	6
12. Day to day life is chaotic......................................	1	2	3	4	5	6
13. Having sexual concerns is reasonable............................	1	2	3	4	5	6
14. What lies ahead is never known..................................	1	2	3	4	5	6
15. Feeling despair at times is natural.............................	1	2	3	4	5	6

In My Life I Believe:	STRONGLY DISAGREE	MODERATELY DISAGREE	SLIGHTLY DISAGREE	SLIGHTLY AGREE	MODERATELY AGREE	STRONGLY AGREE
16. One cannot rely on support from others	1	2	3	4	5	6
17. Having friends makes a difference in life	1	2	3	4	5	6
18. Information provided is seldom understandable	1	2	3	4	5	6
19. It is reasonable having rules to guide life	1	2	3	4	5	6
20. Having a purpose in life is worthwhile	1	2	3	4	5	6
21. Feeling helpless can be overcome	1	2	3	4	5	6
22. One can compensate for a lack of strength and energy	1	2	3	4	5	6
23. Changing is seldom worth the effort	1	2	3	4	5	6
24. Perserverance never makes a difference in the end	1	2	3	4	5	6
25. There is no limits to what one can achieve in life	1	2	3	4	5	6
26. Having values to live by is pointless	1	2	3	4	5	6
27. Love is dependable	1	2	3	4	5	6
28. Taking risks is dangerous	1	2	3	4	5	6
29. Everyday of one's life counts	1	2	3	4	5	6
30. Measures can be taken to prevent illness	1	2	3	4	5	6
31. Doing one's best is never enough	1	2	3	4	5	6
32. What one does in life matters	1	2	3	4	5	6
33. Personal limitations can be accepted	1	2	3	4	5	6
34. Feeling good about oneself makes sense under all circumstances.	1	2	3	4	5	6
35. Life is a guessing game	1	2	3	4	5	6
36. Each individual has his own merit	1	2	3	4	5	6
37. Being optimistic seldom makes sense	1	2	3	4	5	6
38. Every experience in life is useful	1	2	3	4	5	6
39. One can learn from mistakes	1	2	3	4	5	6
40. Help one receives is seldom adequate	1	2	3	4	5	6

SECTION TWO

DIRECTIONS:

This section of the questionnaire is to determine how you view *your* state of health. Each item is a statement about what *you perceive* to be *your* current level of health. For each item, please check the box that represents the extent to which the statement reflects your current behavior or state of functioning or state of health.

Check *only one* box for each item.

There are no right or wrong answers; this is a measure of *your* personal health. It is important that you respond according to your *present state* of health and not according to what you would like your health to be.

A. Is there any state or condition of your health, general or specific, that you feel is painful?

1 ☐ no painful condition.
2 ☐ a mildly painful condition.
3 ☐ a moderately painful condition.
4 ☐ a severely painful condition.

B. To what extent, if at all, does the state or condition of your health prevent you from carrying out the activities of living that you feel are appropriate to engage in for you?

1 ☐ no limitations.
2 ☐ mild limitations.
3 ☐ moderate limitations.
4 ☐ severe limitations.

C. Considering the most serious state or condition of health that you have observed, would you say that your current state of health is:

1 ☐ not acute or chronic?
2 ☐ mild, acute and self-limitating?
3 ☐ mild, chronic and stable?
4 ☐ serious, chronic and stable?
5 ☐ serious, chronic and degenerating?
6 ☐ serious, acute and life-threatening?

D. Considering all aspects of your health, would you say that you require:

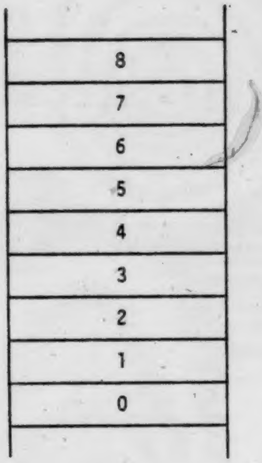
1 ☐ no particular health related action?

2 ☐ efforts at reducing known risk factors?

3 ☐ investigation, observation and supervision by the health care system?

4 ☐ active medical treatment?

E. Below is a picture of a ladder. The top of the ladder represents perfect health, and the bottom represents the worst possible health imaginable.



BEST POSSIBLE HEALTH

WORST POSSIBLE HEALTH

On which step of the ladder would you say your health is at present? ______

ADDITIONAL COMMENTS:

Thank-you For Your Co-operation in Completing This Questionnaire.

APPENDIX II

UNIVERSITY HOSPITAL OF ALBERTA

CARDIAC REHABILITATION PROGRAM'S EXERCISE PRESCRIPTION

uah MOBILIZATION ROUTINE	Date	Initial	Comments
The first 24 hours: Complete bedrest, if no complications arise then progress to:			
DAY 1 Bedrest, bathroom privileges per commode chair; Dangle for meals.			
DAY 2 Bedrest, bathroom privileges per commode chair; Sitting in chair for 10 minutes twice a day.			
DAY 3 Bedrest, bathroom privileges per commode chair; Sitting in chair 10 minutes four times a day.			
DAY 4 Bedrest, bathroom privileges with a nurses assistance; Sitting in chair 20 minutes four times a day.			
DAY 5 Wash in bathroom; Sitting in chair 30 minutes four times a day.			
DAY 6 Walk in room.			
DAY 7 Short walks in hall four times a day. (A short walk equals one-third of the length of a city block.) Walks should be taken before or one hour after a meal.			
DAY 8 Walk one flight of stairs with supervision. (One flight is up to the first landing i.e. one half the distance between floors.)			
DAY 9 Walk two flights of stairs with supervision. (Two flights is up to the next floor ONLY.)			

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EXERCISE: A PRESCRIPTION OF ACTIVITY FOR THE CARDIAC PATIENT

You are now ready to go home after convalescing in hospital from your heart attack and you have gradually been increasing your exercise under the supervision of your Doctor and Nurses. Not all patients are candidates for exercise programs, but you can do your part in regaining your fitness by gradually increasing your daily activities.

The type of exercise you should be doing is important because not all types of exercise are useful for physical and cardiovascular fitness. Isometric exercise or "static" exercises fall in the category of activities to avoid. An isometric exercise is one that involves continuous contraction of a muscle group, as seen when carrying a suitcase or bag of groceries. This isometric exercise causes less blood to flow into the muscle instead of more, thereby causing the blood pressure to rise higher and thus; isometric exercise is an oxygen consuming activity which causes the heart to work harder.

The recommended exercise is of a dynamic nature, one that involves repetitive contraction and relaxation of muscle groups. Walking is the most common example of this but others include jogging, cycling, swimming and cross-country skiing. An exercise or walking program may be of value to you when you go home but it is important that you rest and give the scar in your heart a chance to heal fully. For this reason, gradually increasing your activity over a period of weeks is recommended rather than starting at too high a level.

The following table may serve as a "guide" for you.

After Discharge From Hospital

Week 1 - Walk 5 minutes at a leisurely pace (1/4 mile) once/day.
Week 2 - Walk 5 minutes at a leisurely pace (1/4 mile) twice/day.
Week 3 - Walk 10 minutes at a leisurely pace (1/2 mile) once/day.
Week 4 - Walk 10 minutes at a leisurely pace (1/2 mile) twice/day.
Week 5 - Walk 15 minutes at a leisurely pace (3/4 mile) once/day.
Week 6 - Walk 15 minutes at a leisurely pace (3/4 mile) twice/day.
Week 7 - Walk 20 minutes at a leisurely pace (1½ mile) once day.
Week 8 - Walk 20 minutes at a moderate pace (1½ mile) twide day.
Week 9 - Walk 30 minutes at a moderate pace (2 miles) once/day.

Again, this is only a guide to give you an idea of the amount of exercise you may be capable of doing.

It is a good idea to take your pulse immediately after this exercise and check that it is not greater than 115 beats per minute. If you find that your pulse is higher than 115 per minute, or if you are experiencing chest pain, pressure, palpitations or shortness of breath stay at the level you were previously doing without difficulty for another week.

If any of these symptoms persist while you are doing your walking, check with your Doctor before continuing your exercise program.

At this time, 8-12 weeks after your discharge it may be time for you to see your Cardiologist and possibly be considered for a group exercise session. There is a supervised Cardiac Exercise Program available at the University of Alberta Hospital and if you are interested in participating you may ask your Cardiologist for further information.

Some General Rules for Activity Are:

1. Avoid outdoor activity in very cold or very hot weather.
2. In summer walk in the early morning or late afternoon and in winter at midday.
3. Carry your nitroglycerin and money for the phone booth.
4. REMEMBER whatever distance you walk you must get back.
5. Do not exercise right after meals.
6. Do not exercise if you are feeling unwell, as this is additional stress on the heart.
7. Avoid activity of any length that involves your arms over the head.
8. Lifting heavy objects is an ISOMETRIC activity and should be avoided (carrying groceries, lifting wet clothes out of the washer, changing a flat tire, etc.).

PHYSICAL CAPACITY RATING SCALE

Level	EXERCISE					½ mile run	1 mile walk
	1	2	3	4	5	In minutes	
A+	20	18	18	13	400	5½	17
A	18	17	17	12	375	5½	17
A–	16	15	16	11	335	5½	17
B+	14	13	15	9	320	6	18
B	12	12	14	8	305	6	18
B–	10	11	13	7	280	6	18
C+	8	9	12	6	260	6½	19
C	7	8	10	5	235	6½	19
C–	6	7	8	4	205	6½	19
D+	4	5	6	3	175	7	20
D	3	4	5	3	145	7½	21
D–	2	3	4	2	100	8	21
Minutes for each exercise	2	1	1	1	6		

AGE GROUPS

6 yrs maintains B
7 yrs maintains A

CHART 1 --

1 Feet astride, arms upward.
—Forward bend to floor touching then stretch upward and backward bend.
—Do not strain to keep knees straight.

2 Back lying, feet 6" apart, arms at sides.
—Sit up just far enough to see your heels.
—Keep legs straight, head and shoulders must clear the floor.

3 Front lying, palms placed under the thighs.
—Raise head and one leg, repeat using legs alternately.
—Keep leg straight at the knee, thighs must clear the palms.

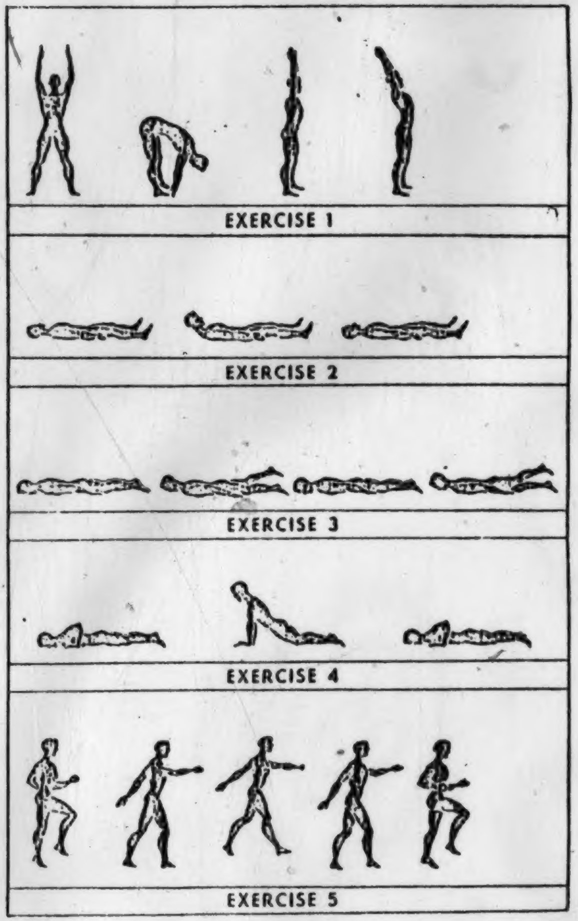
(Count one each time second leg touches floor.)

4 Front lying, hands under the shoulders, palms flat on the floor.
—Straighten arms lifting upper body, keeping the knees on the floor. Bend arms to lower body.
—Keep body straight from the knees, arms must be fully extended, chest must touch floor to complete one movement.

5 Stationary run—(count a step each time left foot touches floor—Lift feet approximately 4 inches off floor). Every 75 steps do 10 "scissor jumps". Repeat this sequence until required number of steps is completed.

Scissor jumps—Stand with right leg and left arm extended forward, and left leg and right arm extended backward.
Jump up—change position of arms and legs before landing. Repeat (arms shoulder high)

CHART 1



PHYSICAL CAPACITY RATING SCALE

Level	EXERCISE					1 mile run	2 mile walk
	1	2	3	4	5	In minutes	
A+	30	23	33	20	500	9	30
A	29	21	31	19	485	9	31
A–	28	20	29	18	470	9	32
B+	26	18	27	17	455	9½	33
B	24	17	25	16	445	9½	33
B–	22	16	23	15	440	9½	33
C+	20	15	21	14	425	10	34
C	19	14	19	13	410	10	34
C–	18	13	17	12	395	10	34
D+	16	12	15	11	380	10½	35
D	15	11	14	10	360	10½	35
D–	14	10	13	9	335	10½	35
Minutes for each exercise	2	1	1	1	6		

AGE GROUPS

8 yrs maintains D–
9 yrs maintains C–
10 yrs maintains B–
11 yrs maintains A–
45-49 yrs maintains A+
50-60 yrs maintains C+

CHART 2 —

1 Feet astride, arms upward.

—Touch floor and press (bounce) once then stretch upward and backward bend. Do not strain to keep knees straight.

2 Back lying, feet 6" apart, arms at sides.

—"Sit up" to vertical position, keep feet on floor even if it is necessary to hook them under a chair. Allow knees to bend slightly.

3 Front lying, palms placed under thighs.

—Raise head, shoulders, and both legs.

—Keep legs straight, both thighs must clear the palms.

4 Front lying, hands under the shoulder, palms flat on floor.

—Straighten arms to lift body with only palms and toes on the floor. Back straight.

—Chest must touch floor for each completed movement after arms have been fully extended

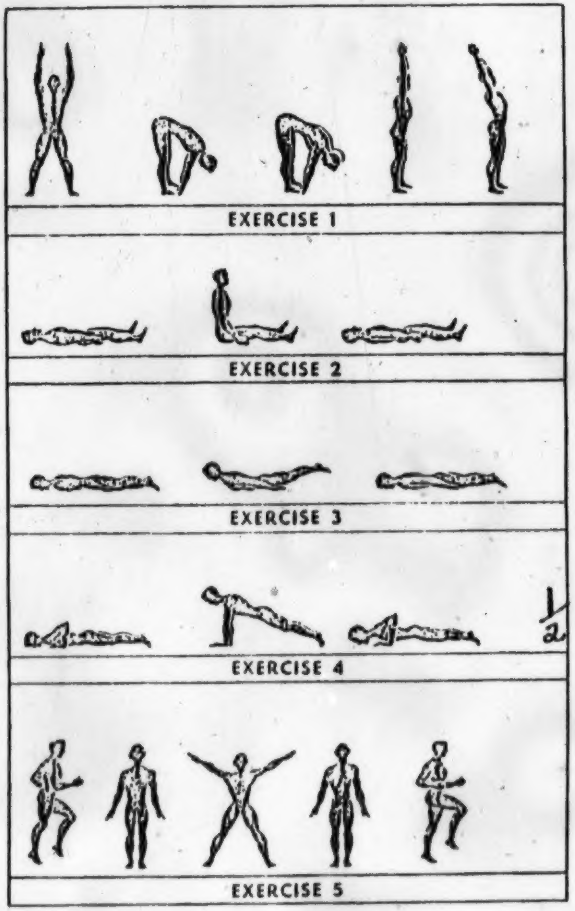
5 Stationary run—(count a step each time left foot touches floor—Lift feet approximately 4 inches off floor). After every 75 steps, do 10 "astride jumps". Repeat this sequence until required number of steps is completed.

Astride Jumps—feet together, arms at side.

Jump and land with feet astride and arms raised sideways to slightly above shoulder height. Return with a jump to the starting position for count of one.

Keep arms straight.

CHART 2



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APPENDIX III

DEMOGRAPHIC DATA, RISK FACTOR PROFILE AND PHYSIOLOGICAL PARAMETERS

Profile of Subject

AGE

1 30-35 yrs
2 36-41 yrs
3 42-47 yrs
4 48-53 yrs
5 54-59 yrs
6 60-65 yrs

MARITAL STATUS

1 Single
2 Married
3 Separated
4 Divorced
5 Widowed

SOCIAL SUPPORTS

1 Alone
2 Family Only
3 Friends Only
4 Family and Friends

OCCUPATION

1 Professional
2 Skilled
3 Semi-Skilled
4 Laborer

CURRENT EMPLOYMENT STATUS

1 Full Time
2 Part Time
3 Retired
4 Unemployed
5 Unable to Work

PREVIOUS MYOCARDIAL INFARCTIONS

1 None
2 One
3 Two
4 Three

ADDITIONAL HEALTH PROBLEMS

1 No

2 Yes (Diabetes, Hypertension, Ulcers, C.V.A., Diverticulitis, Arthritis, Asthma)

COMPLICATIONS ASSOCIATED WITH CURRENT HEALTH STATE

1 No

2 Yes (Dyspnea, Angina, Congestive Heart Failure, Pericarditis)

PRESCRIBED MEDICATIONS

1 None
2 Nitrates/Vasodilators
3 Beta Blockers
4 Digoxin
5 Diuretics
6 Other (Tagamet, Insulin, A.S.A., Anturan, Valium, Librium, Antihypertensives, Anti-Arrhymics)
7 Combinations of the Above

Risk Factors

Body Weight For Height

1 = < mean

2 = mean

3 = > mean

Current Smoking Status

1 = not a smoker

2 = less than 1 pack per day

3 = 1 pack per day

4 = more than 1 pack per day

Exercise Habits

1 = no or occasional exercise

2 = regular exercise

Physical Activity

1 = sedentary and light work (1,066 kcal/day)

2 = moderate to heavy work (1,876 kcal/day)

Stress

1 = no

2 = mild (Pertaining to family, work, financial or other)

3 = moderate

4 = severe

Family History of Heart Disease

1 = no

2 = yes

PHYSIOLOGICAL PARAMETERS

(SUBMAXIMAL EXERCISE)

Total Work (kpm)

Highest H.R. (heart rate in beats/minute)

Highest S.B.P. (systolic blood pressure in m.m. Hg)

Double Product (maximum H.R. x maximum S.B.P.)/1000

Maximum Δ S-T (measured in m.m. as change from control values at rest)

Pain 1 no 2 yes

Fatigue 1 no 2 yes

Arrhytmias 1 no 2 yes

Dyspnea 1 no 2 yes

AVERAGE WEIGHT FOR HEIGHT AND AGE

	30-39 yrs	40-49 yrs	50-59 yrs
152 cm	59 kilograms	61 kilograms	62 kilograms
155	61	62	63
158	62	63	64
160	64	65	66
163	66	67	68
165	68	69	69
168	69	71	71
170	71	73	73
173	73	75	75
175	75	77	77
178	77	79	79
180	79	81	82
183	81	83	84
185	83	85	86
188	85	87	88
191	88	89	90
193	90	92	93

Based on 1975 by Society of Actuaries

APPENDIX IV

PARTICIPANT COVERING LETTER, CONSENT FORM AND OATH OF CONFIDENTIALITY

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

Dear Participant:

I am conducting a study to determine what factors may account for an individual's level of health. Your point of view would be very valuable to health care workers who plan rehabilitation programs. Your cardiologist is aware of this study, and he has given permission to seek your assistance.

In accordance with the law, the investigator is required to keep your responses completely confidential. On the questionnaire, codes will be used instead of names and only the investigator will have access to the names.

I hope that you will be willing to participate in this study by agreeing with the points outlined in the consent form attached and completing the questionnaire as directed. Thank-you for your consideration of this matter.

Sincerely,

Louise Payne

Louise Payne, R.N., B.Sc.
(MN Candidate)

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

PATIENT CONSENT FORM

This is to indicate that I, ______________________________, have agreed to participate in a study to be conducted by Louise Payne, a Masters in Nursing Candidate, on the factors which may contribute to health. It is my understanding that:

1) my participation in the study is voluntary and I will be able to withdraw from the study at any time with no consequences;
2) I will be answering a questionnaire at two different intervals during the study;
3) I will be required to keep a record of my activity during the study;
4) my patient records may be used to gather some information for this study. However, such information and any other information collected for this study will be kept confidential;
5) my name will not appear in any research report, and;
6) I may not necessarily benefit from participating in the study.

Signature: ______________________________

Date: ______________________________

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

July 24, 1980

TO WHOM IT MAY CONCERN:

I, the undersigned, do solemnly swear that I will hold in confidence the names of the participants in a study entitled "Sense of Coherence: A Measure of Health Status", and that the responses and other information obtained from the participants will be held in strict confidence and used only for the purposes identified in the above-named research study.

Louise Payne

Louise Payne, R.N., BSc.
(M.N. Candidate)

Sworn before me at Edmonton, Alberta
This 24th day of July 1980

B. Wilde

JAMES B. WILDE
BARRISTER SOLICITOR NOTARY

APPENDIX V

ACTIVITY RECORD

ACTIVITY RECORD

CODE NUMBER __________

WEEK OF __________

1. In an average day, how many hours are you spending in each of the following?

_______ hours a day, sleeping

_______ hours a day, working (for pay)

_______ hours a day, watching T.V., listening to radio

_______ hours a day, reading newspaper, magazine, and books

_______ hours a day, working on hobbies

_______ hours a day, working around house or yard

_______ hours a day, doing physical exercise, walking, sports

_______ hours a day, just sitting, relaxing doing nothing

2. In an average week, how many hours are you spending in each of the following?

_______ hours a week, attending church or other meetings

_______ hours a week, visiting and telephoning friends and relatives

_______ hours a week, attending movies, concerts, sports events, or eating out

_______ hours a week, doing volunteer work

_______ hours a week, entertaining friends and relatives

_______ hours a week, alone

_______ hours a week, shopping

3. Describe the physical activity you are doing this week. For example:

   Walking around house
   Walking a block or more
   Walking uphill or stairs
   Running short distances
   Participating in active sports
   Bending, lifting
   Driving a car

4. Describe the other activities you have participated in this week. For example:

   Coffee with friends
   Dining out
   Yard work
   House work
   Hobbies

5. Describe a typical day this week.

APPENDIX VI

LETTERS OF PERMISSION, LETTERS TO CONTENT EXPERTS AND LETTERS TO PARTICIPANTS IN PILOT TEST

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

July 28th, 1980

Dr. R. F. Taylor,
Division of Cardiology,
6th Floor Clinical Sciences Building,
University of Alberta.

Dear Dr. Taylor:

As part of the requirements for the Masters in Nursing degree, I am conducting a study to determine the effects of an exercise program on the health of post-myocardial infarction patients. Dr. S. Stinson, Professor, Faculty of Nursing is chairman of my thesis committee.

I wish to discuss the possibility of attaining the Division of Cardiology's cooperation in conducting this study as well as the attainment of subjects for the project. This study will also be further reviewed by the U.A.H. Ethics Review Board.

Enclosed, please find a copy of the research proposal. I hope this proposed study would be of benefit and interest to the Division of Cardiology and will discuss details at our scheduled meeting.

Thank you for your attention to this matter.

Respectfully,

Louise Payne

Louise Payne R.N., BSc.
MN Candidate.

Enc.

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

July 28, 1980

Mrs. Donna Smith,
Vice President Nursing,
University of Alberta Hospital.

Dear Donna:

Further to our telephone conversation, please find enclosed the research proposal entitled Sense of Coherence; A Measure of Health Status. The proposed study is my thesis for the Masters in Nursing Degree under the chairperson of Dr. Shirley Stinson, Professor, Faculty of Nursing.

The purpose of the study is to determine the effects of an exercise program on the health of post-myocardial infarction patients. My intention is to obtain consent from post myocardial infarction subjects for participation in the study, prior to discharge from hospital. A copy of the research proposal has been submitted to Dr. Taylor, Division of Cardiology, for cooperation in obtaining subjects for the study and the participation of the University of Alberta Hospital, Cardiac Rehabilitation Program as the exercise program to be utilized in this study.

Thank-you for your cooperation in submitting the proposal to the Scientific Ethics Review Committee. I anticipate data collection in September/October, 1980. Your attention to this matter is appreciated.

Respectfully

Louise Payne

Louise Payne R.N., BSc.
M.N. Candidate

Enc.

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

I am conducting a research project, under the direction of Dr. S. Stinson, Dr. C. B. Hazlett, and Dr. H. Simmons, aimed at developing an instrument that measures a major variable in determining the health status of individuals. As you have expertise in this area, I am asking for your assistance in the initial phase of the project.

The purpose of the project is to develop an instrument that will measure the health status of myocardial infarction patients, based on Antonovsky's Salutogenic Model of Health. The first section of the Health Inventory is designed to measure the degree of "Sense of Coherence" and the second section is designed to measure "Health Status" based on Antonovsky's four facets of the health ease - dis-ease continuum.

To assist you, I have enclosed a brief summary of the salutogenic model of health taken from: A. Antonovsky. Health, stress and coping, Jossey-Bass, 1979. In addition, the framework utilized for item development has also been included.

As a content expert, I would ask that you (1) evaluate the items, as requested on the Guidelines for Item Review Sheet; and (2) provide me with a summary statement as to

1. the relevancy of the items to the theory of the model;
2. the question of whether the universe of items has been achieved; and
3. the clarity, ease of understanding and lack of ambiguity of items.

Space has been provided between each item for you to make any additional comments or changes that you feel are required. For your ease in evaluation, the items have been left grouped according to the factors of the model desired to measure. The final instrument will consist of a randomized arrangement of items.

...../2

Due to time constraints, return of your comments by February 9 if at all possible, would be appreciated. Please return the document on Framework for Developing Items along with your item appraisals. A copy of the completed thesis which will include the final versions of the framework and instrument will be made available to you. Thank-you for your assistance.

Yours truly,

Louise Payne
MN Candidate
University of Alberta
Faculty of Nursing

LP/lc
Encl.

GUIDELINES FOR ITEM REVIEW

In reviewing the items, please evaluate according to each of the following criteria:

1. the relevancy of each item to the theory of the model and place a check mark in the appropriate column provided. Where irrelevant, please use the comment space provided, following each item for your rationale and suggestions for changes.

2. the clarity, ease of understanding and lack of ambiguity of each item by making any changes or suggestions in the comment space provided following each item.

3. the question of whether the universe of items has been achieved by using the comment sheet provided at the end for your additional items, suggestions and overall appraisal of the instrument.

NOTE: Key for item review

P refers to positive items.

N refers to negative items.

F refers to false level items.

Thank-you.

THE UNIVERSITY OF ALBERTA

FACULTY OF NURSING

CLINICAL SCIENCES BUILDING
EDMONTON, CANADA T6G 2G3

Dear Participant:

I am conducting a study to determine what factors are important in promoting one's level of health. Your point of view would be valuable at this phase of the project. As this is a pilot test of the questionnaire, space has been provided for you to critique any items which you have difficulty responding to.

In accordance with the law, the investigator is required to keep your responses confidential. You are assured of complete anonimity. Only a code for purposes of data analysis appears on the questionnaire.

I hope you will be a participant in this study by completing the questionnaire, along with your comments, and return it in the addressed envelope by March 6, 1981. Thank-you for your assistance in this study.

Yours truly,

Louise Payne

Louise Payne
M.N. Candidate
University of Alberta